ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 7.] [1906.

XXXIX.—PARA RUBBER.

(*Hevea brasiliensis*, Muell. Arg.)

THE RISE AND FALL IN PRICES OF THE FOREST PRODUCT FOR THE PAST 30 YEARS AND OF THE CULTIVATED FORM FOR THE PAST 4 YEARS.

In the *Kew Bulletin* for 1898 a chart was published shewing the average prices of fine Para rubber (*Hevea brasiliensis*), for the years 1877 to 1898 inclusive, and in view of the constantly increasing importance of the rubber industry it has been considered expedient to bring this up to date. A graphical writing should explain itself, and without entering on too great detail it will be observed that the general tendency has been an upward one, although some of the variations are rather remarkable. At no period has the price remained fixed throughout any particular year, the nearest approach to this occurring in 1897 with a range of 3*d*. only; the greatest deviation from it in 1879 with a range of 2*s*. The figures, maximum, minimum, and average, in all instances, are given minus fractions of a penny.

Some explanation is necessary in connection with the lines for cultivated or plantation Para rubber, which so far appears to have come exclusively from Ceylon and the Straits Settlements. The history of the industry in respect of these Colonies has been fully discussed in previous issues of the *Bulletin*, and it will, perhaps, be unnecessary here to do more than point out that the plantation rubber, according to statistics, first began to appear in marketable quantities in 1903, although exports on a smaller scale from Ceylon were made in 1901 (*Ceylon Administration Reports*, 1901, part iv., p. H 2, Roy. Bot. Gardens). Samples had been submitted as early as 1882 from there (*Kew Bulletin*, 1898, p. 255), and in 1898 from the Straits Settlements (*Kew Bulletin*, 1898, p. 274; and 1899, p. 22). On this subject it

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may also be of interest to quote the following letter from the Straits' *Agricultural Bulletin* (Vol. ii., 1903, p. 193), which, together with the accompanying chart, will give a fair idea as to their relative positions and to the trade in general at that date (1903).

"36, Fenchurch Street,
"London, E.C.,
"7th April, 1903.

"Harold Tunnicliffe, Esq.,
"Atherton Estate, Port Dickson,
"Straits Settlements.

"DEAR SIR,

"We duly received your favour of the 8th March with sample of rubber grown from Para seed. There are fair quantities of similar rubber beginning to come from Ceylon and they find a ready market. The sample which you send us seems to be of very good quality, tho' perhaps a trifle 'tacky' which, however, may be due to the way in which the sample has been sent and may not be the case in bulk. In to-day's market, which is a good one, we should think a parcel of this rubber would fetch from 4*s.* 3*d.* to 4*s.* 5*d.* per lb., and our idea of the immediate future of the article, anyhow until next autumn, being a favourable one, we don't think that a shipment on the basis of our valuation will lead to disappointment.

* * * * * *

"(Signed) Hecht, Levis and Kahn."

As shewing the improvement on the beginning referred to in the above letter, it is stated that "the most remarkable development in Ceylon Agriculture during 1905 was the planting of rubber, under which there were at the end of 1905 some 40,000 acres as compared with 11,000 in 1904 and 7,500 in 1903, and the value of rubber exported in 1905 was Rs. 557,945 as compared with Rs. 221,000 in 1904." (Colonial Report, No. 494, Ceylon, 1906, p. 23.)

It remains to be seen how soon, and to what extent, the West Indies, West Africa, and other Colonies that have taken up the cultivation of this product, will meet the requirements of the market.

J. H. H.

XL.—PLANT DISEASES: VI.—POTATO LEAF-CURL.

(*Macrosporium solani*, Cooke. Syn., *M. tomato*, Cooke.)

Symptoms indicating the presence of this disease are very pronounced. In what may be termed a mild attack, which usually manifests itself only after the haulm is nearly full-grown, the leaves change to a sickly yellowish green colour and afterwards curl up at the edges; the haulm soon afterwards becomes limp, and finally droops. If the course of the disease is carefully followed it will be observed that the lowest leaves are attacked first, the disease gradually ascending the haulm until all the leaves are involved. When the haulm collapses there is

usually no external evidence of the presence of the fungus, but if the tissues are examined microscopically an abundance of mycelium will be met with. When the haulm and leaves are dead or nearly so, the fruit of the fungus appears in abundance; on the leaves it forms minutely velvety blackish-olive patches of variable form and size, whereas on the haulm it appears under the form of long thin streaks. The difference in superficial appearance between the broadly effused patches on the foliage, and the long narrow streaks on the stem, has led to the supposition that two distinct parasites are present. The supposition is a mistaken one, only one parasite is present; the difference between the appearance on the leaves and stem respectively is a matter of mechanics and not of species. On the stem the fruit of the fungus can only break through to the surface between the parallel rows of vascular bundles, hence the long, narrow streaks; whereas the arrangement of the veins in the leaf admits of the fruit appearing in extended patches.

In an acute attack the haulm is stunted from the first, and rarely attains to a length of six inches, the leaves also remain quite small and are much curled. In such cases no new tubers are formed. Sometimes the "sprouts" are killed outright in the youngest stage before they appear above-ground. In such an instance if the "set" is examined it will be found to be quite firm and apparently practically unchanged.

It has already been explained elsewhere that "leaf-curl" is perpetuated from year to year by the presence of mycelium in the tuber (*Kew Bulletin*, 1906, p. 110; *Journ. Board Agric.*, September, 1906). When a tuber infested with mycelium is planted, the mycelium grows along with the stem and enters the leaves; it also passes into the young tubers. When a tuber is only slightly infested with mycelium, it follows the course indicated, and its further behaviour as to remaining in a subordinate condition in the tissues of the potato plant, and doing little harm beyond infecting the new tubers; or whether it assumes a rampant form and destroys the above-ground portion of the potato plant, depends almost entirely on weather conditions.

On the other hand when a tuber is badly infested with mycelium it is often completely dead before it is planted. If not quite killed it may produce the dwarfed growth already described. As the fungus mycelium does not destroy the starch, but only the proteid substance, it is practically impossible by any superficial method to determine whether a tuber is killed or not. This can only be determined by a microscopic examination.

Owing to the fact that the conidia of the fungus are only produced on dead or dying plants, and mostly in the autumn, the epidemic is not increased by healthy plants having their foliage infected by the conidia produced on diseased plants, as in the case with "potato disease" caused by *Phytophthora infestans*, De Bary. Quite young shoots have been infected, late in the season, with conidia obtained from dead plants of the same year, but the infection remained local and did not extend backwards down the haulm, hence the young tubers could not be infected with mycelium.

From the statements made it will be gathered that infection can only take place through the tuber. This can be effected in two ways; from a previously diseased tuber that has been used as a "set," or from conidia present in the ground. The latter method implies the previous growth of a diseased crop on the same land. In either case when a tuber once contains the hybernating mycelium of the fungus, the probability is that its offspring will be infected for all time, the mycelium passing from one generation to another. This statement however is not absolute. Last year tubers obtained from potatoes badly affected with "leaf-curl" were planted in the experimental ground adjoining the Jodrell Laboratory at Kew, and every plant showed the disease in every part. The tubers produced by this crop were planted again this year, and although every plant is obviously diseased, one root bearing four haulms has one haulm very badly diseased, the other three being perfectly healthy. Another root with five haulms has two diseased, the remaining three healthy. All the other plants are diseased throughout. The probable explanation of this is that for some unknown reason, the mycelium present in the tuber did not pass up into the shoots that remained free from disease.

The blackish patches that appear on diseased leaves and haulms consist entirely of conidia or reproductive bodies of the fungus, which originate from the dense weft of mycelium present in the tissues of the potato plant. The conidia are comparatively large, dark coloured, and when mature are divided into several cells by walls developed more or less at right-angles to each other. When once mature these conidia will germinate readily during any period of the year, provided the requisite conditions are present. In a state of nature, however, it so happens that such conditions are not forthcoming at all seasons, but only during that period which coincides with the growth of young potato tubers. The two factors necessary for the vigorous germination of conidia are, a given temperature and the presence of moisture. A series of experiments show that the *minimum* or lowest temperature at which coinidia will germinate in a manner sufficiently vigorous to effect inoculation is 47° F. This prevents the majority of conidia produced on the dead leaves and haulms in autumn from germinating until the following season. The *optimum*, or most suitable temperature for germination is 64° F. The *maximum*, or highest temperature for healthy germination is 78° F. The rate of germination at the optimum temperature of 64° F. is twice as rapid as at minimum or maximum temperature. In twelve hours many very long, much branched germ-tubes are produced, and within twenty-four hours numerous secondary conidia are produced on the germ-tubes. These secondary conidia are produced in chains simulating the form-genus *Alternaria*. In cultures of germinating conidia, when the food becomes exhausted, the contents of the germ-tubes concentrate at intervals into small masses which become surrounded by a thick wall, and are practically chlamydospores or resting-spores, which can only be induced to germinate after a period of rest. Such resting-spores have germinated after having been kept in the laboratory for six months in a perfectly dry condition, and it is quite probable that such resting-spores may remain in the soil from one season to another without losing their power of germination.

The dependence on favourable conditions as to temperature and other factors, influencing the germination and power of infection of conidia present in the soil; also the dependence on weather of the relative growth of mycelium in an infected tuber, serve to explain why the disease is much more prevalent during some seasons than others, also why during certain seasons there is practically no disease present.

Experiments prove that tubers can only be infected during the earliest stage of growth; when the tuber has reached the size of a marble and a definite periderm or skin is formed, it is free from danger.

Judged from a morphological standpoint the relationship of the fungus causing "leaf-curl" to that of another fungus—*Macrosporium tomato*, Cooke, parasitic on cultivated tomatoes, was some years ago indicated as follows:—"This fungus is closely allied to, if not identical with the *Macrosporium* causing black stripe, or blotch on the tomato" (*Text-book of Plant-diseases*, p. 323). Inoculation experiments have proved this supposition to be correct. Conidia produced on a potato plant will infect a tomato and *vice versâ*. The discovery facilitates matters to the extent of deleting one supposed parasitic entity, and also indicates the danger of the disease passing from one crop to the other when the two are growing in close proximity.

The practical deductions to be derived from the foregoing remarks are as follows:—

Potato tubers for planting should be obtained from a district free from disease.

Potatoes should not be planted, for a period of three years, on land that has produced a diseased crop.

Diseased haulms should be collected and burned or deeply buried. This is important, otherwise the land will become infected.

Diseased tomato stems and fruit should be dealt with as above, otherwise the potato crop may suffer.

XLI.—DIAGNOSES AFRICANAE: XVIII.

864. **Guarea Thompsoni**, *Sprague et Hutchinson* [Meliaceae]; ab affini *G. Zenkeri*, Harms, inflorescentia pyramidali recedit.

Arbor ramulis glabris 1 cm. diametro vel ultra. *Folia* 7–8-juga, glabra; petiolus circa 8 cm. longus, semiteres, marginibus paullo inflexis; foliola oblonga vel obovato-oblonga, rarius oblanceolata, 10–20 cm. longa, 4·5–7·5 cm. lata, apice obtusa, interdum brevissime acuminata, nonnunquam retusa, basi rotundata vel obtuse cuneata, chartacea, utrinque opaca, venis et venulis supra inconspicuis, subtus prominulis, lateralibus utrinque 11–14 patulis vel satis obliquis; petioluli 6–11 mm. longi, supra canaliculati. *Paniculae* axillares, plures versus apicem ramulorum dispositae, anguste pyramidales, 12–30 cm. longae, rhachi puberula; bracteae minutae, depresso-deltoideae; pedicelli 4–7 mm. longi, pubescentes. *Calyx* cupularis, 3 mm. altus, 4 mm. diametro, paullo quinqueundulatus potius quam lobatus, extra pubescens, intus glaber. *Petala* 5

vel 6, imbricata, oblonga, basin versus angustata, apice rotundata vel obtusa, 8–10 mm. longa, circa 3 mm. lata, extra minute pubescentia, intus glabra. *Tubus staminalis* glaber, medio ventricosus, 7–7·5 mm. longus, apice 10–15-lobatus; lobi oblongi, 1·25–1·5 mm. longi, 0·5 mm. lati, apice breviter bifidi, lobulis obtusis; antherae 10–15, cymbiformes, tubo vix infra incisuras sessiles, 1–1·25 mm. longae, circa 0·5 mm. latae. *Ovarium* sessile, oblongum, 5 mm. longum, 1·5–2 mm. diametro, longe pilosum, 4–5-loculare, loculis 1 mm. supra basin sitis, biovulatis, ovulis inaequialte collateralibus pendulis, supra loculos cavum; stylus 2–2·5 mm. longus, glaber, stigmate peltato glabro 1·75–2 mm. diametro. *Fructus* desunt.

Southern Nigeria. Benin City, *H. N. Thompson*, 16.

865. **Gymnosporia deflexa**, *Sprague* [Celastraceae]; ab affini *Celastro albato*, N. E. Brown, foliis majoribus lanceolato-ovatis pedicellis duplo longioribus recedit.

Arbor mediocris (fide *Grenfell*), vel magna (fide *Burtt-Davy*). *Ramuli* circa 20 cm. longi, inermes, leviter flexuosi, teretes, glabri, juniores pallide glauco-virides, superne compressi, seniores cinereo-corticati rugulosi, internodiis 1–4 cm. longis. *Folia* solitaria, lanceolato-ovata, apice obtusissima, basi cuneata, simpliciter vel subdupliciter dentato-serrata, tenuiter coriacea, supra pallide viridia vel glauco-viridia, venulis prominulis crebre reticulata, subtus albido-glauca venis satis prominentibus, venulis quam supra minus conspicuis; venae laterales utrinque 10–11; lamina 7–14 cm. longa, 3·5–6 cm. lata; petiolus circa 1 cm. longus, supra excavatus. *Flores* axillares, 10–30-fasciculati, pentameri; pedicelli 15–18 mm. longi, 5–6 mm. supra basin conspicue articulati. *Sepala* anthesi deflexa, ovato-oblonga, supra concava, 1–1·75 mm. longa, 1–1·25 mm. lata, submembranacea, apice vel usque medium ± brunneo-lacerata vel denticulata. *Petala* anthesi deflexa, elliptico-ovata, rotundata, subtus infra medium valde concava, apice inflexa, 4·75–5 mm. longa, circa 3 mm. lata. *Discus* annularis, 0·6–0·7 mm. latus. *Filamenta* 1·5 mm. longa; antherae suborbiculares, circa 0·7 mm. diametro. *Ovarium* triloculare, 1·25 mm. altum; stylus 0·5–0·75 mm. longus; stigmata 3 crassa; ovula pro loculo 2 erecta. *Capsula* depresse trigono-globosa, 6–8 mm. diametro, stylo persistente apiculata 2–3-sperma, valvis rigide coriaceis, minute elevato-punctatis. *Semina* castanea, arillo incompleto, irregulariter lobato et lacerato minute crenulato.

Transvaal. Zoutpansberg: Woodbush, *Grenfell*, 4; *Grenfell in Transvaal Colonial Herbarium*, 1142; Patata bosch No. 2013, *Burtt-Davy in Transvaal Colonial Herbarium*.

According to Burtt-Davy, *G. deflexa* is common in the Mist-belt forest of the Houtboschberg (Zoutpansberg District) at altitudes of between 1400 and 1500 m. It is there known as "Saffraan-hout," on account of the yellow colour of its inner bark.

866. **Gymnosporia condensata**, *Sprague* [Celastraceae]; affinis *Celastro polyacantho*, Sond., cymis condensatis floribusque majoribus ab eo recedit.

Arbor parva. *Ramulus* unicus exstans 30 cm. longus, spinis validis armatus, subteres, glaber, pallide glauco-viridis, internodiis 0·7–2 cm. longis. *Folia* supra spinos fasciculata, oblanceolata vel

anguste obovata, apice obtusa rotundata vel paullo emarginata, saepius mucronulata, versus basin sensim angustata, minute glanduloso-serrulata, chartacea, utrinque pallide glauco-viridia, venis et venulis supra occultis subtus prominulis, lateralibus utrinque circa 5; lamina 1·5–2·5 cm. longa, 6–8 mm. lata; petiolus 2–3 mm. longus, supra excavatus. *Cymi* densissimi, e spinis orti. *Flores* pentameri; pedicelli 3–3·5 mm. longi. *Sepala* anthesi patentia, suborbicularia, 0·5–1 mm. diametro, lacerato-denticulata, supra leviter concava, submembranacea. *Petala* tandem patentia vel paullo deflexa, elliptica vel ovato-elliptica, rotundata, 2·75–3·5 mm. longa, 1·75–2·5 mm. lata, minutissime denticulata. *Discus* annularis, 0·3–0·4 mm. latus. *Filamenta* 1·75–2·25 mm. longa, basi dilatata; antherae reniformes, 0·75 mm. diametro. *Ovarium* triloculare, 0·75 mm. altum; stylus brevissimus; stigmata 3, circa 0·5 mm. longa; ovula pro loculo 2 erecta.

TRANSVAAL. Olifant's River, *Hurley*, 1.

867. **Cissus adenopodus**, *Sprague* [Ampelidaceae]; a ceteris speciebus sectionis *Cyphostemmae*, subsectionis Planchonianae octavae, pedicellis conspicue glanduliferis, inflorescentia ceterum pilis ordinariis vestita recedit.

Planta herbacea, ope cirrhorum scandens. *Radix* tuberosa (fide *Dawe*). *Caulis* teres (exsiccatus costatus), ut petioli et petioluli cirrhique patule pilosus et pilis glandulosis paucioribus vestitus. *Folia* trifoliolata; petioli subteretes, 3–5 cm. longi; petioluli 4–7 mm. longi, medii quam laterales paullo longiores; foliola ovata, acute acuminata, grosse serrata, lateralia basi inaequaliter rotundata vel subcordata, 5–8 cm. longa, 3–4 cm. lata, terminale basi obtusum vel rotundatum, 7–10 cm. longum, 4·5–5·5 cm latum, utrinque setulosa, supra viridia venis in mesophyllo depressis (exsiccando prominulis), subtus rubida venis prominentibus (exsiccando paullo); venae laterales utrinque 5–6. *Stipulae* falcato-lanceolatae, acutae, 7–10 mm. longae, circa 3 mm. latae, extra pilosae. *Panicula* oppositifolia, plana, ambitu triangularis, 3·5 cm. pedunculata, circa 10 cm. longa, vivide rubra, patule pilosa, ramis alternis 0·5–1·5 cm. distantibus. *Bracteae* inconspicuae. *Pedicelli* circa 4 mm. longi, pilis glanduloso-capitatis paucis conspicuis et ordinariis brevibus inconspicuis induti, post anthesin recurvi. *Alabastra* circa 3 mm. longa, apice pilosa. *Calyx* cupularis, 0·75–1 mm. altus, basi puberulus. *Petala* oblonga, obtusa, apice 1–1·5 mm. cucullata, 4 mm. longa, vix 1·5 mm. lata, cucullo rubro extra longiuscule piloso, ceterum glabra viridia, anthesi valde deflexa. *Stamina* prima anthesi ad stylum appressa; filamenta circa 3 mm. longa; antherae late ellipticae, 0·75 mm. longae. *Ovarii* segmenta 0·75 mm. longa; stylus 2·5 mm. longus.

UGANDA. Busiro District, alt. 1200 m., *Dawe*, 224.

Roots of this species were collected by Mr. Dawe in the Mufukamata Forest and sent to Kew, where the plant flowered in the Succulent House in August, 1906. The young shoots and leaves are coloured bright red, and the species is in consequence rather decorative; the upper surface of the leaves soon becomes green, but the stems and the lower surface of the leaves change

but little in colour. *C. adenopodus* does not appear to be nearly related to any *Cissus* hitherto described; perhaps its closest affinity is with *C. Buchananii*, Planch., which has, however, five leaflets and a very glandular inflorescence.

Besides the ordinary and gland-tipped hairs mentioned in the preceding description, a third kind is found on *C. adenopodus*, namely, "pearl-glands." They are present on the inflorescence, usually near the base of the pedicels, on the under surface of the young leaves, and on the outside of the stipules near the base. The view generally adopted nowadays is that pearl-glands are "food-bodies" for ants, at all events in many cases [see Penzig in Atti Congr. Bot. Internaz. 1892, p. 239; and Raciborsky in Flora, vol. lxxxv. 1898, p. 358].

868. **Schotia transvaalensis**, *Rolfe* [Leguminosae-Caesalpinieae]; affinis *S. brachypetalae*, Sond., sed caulibus juvenibus pubescentibus, foliorum rhachi anguste alata, foliolis minoribus submembranaceis, floribus minoribus, petalis exsertis differt.

Caules juvenes pubescentes. *Folia* abrupte pinnata; rhachis anguste alata, 5–6 cm. longa; foliola 4–6-juga, brevissime petiolata, elliptica vel obovato-oblonga, apiculata vel interdum emarginata, submembranacea, glabra, 1·5–3 cm. longa. *Stipula* semicordata, acuminata, 8 mm. longa. *Paniculae* axillares, pubescentes, circa 3 cm. longae, densiflorae. *Bracteae* brevissimae, truncatae. *Flores* breviter pedicellati, coccinei. *Calycis* tubus brevis; lobi obovati, obtusi, circa 1 cm. longi. *Petala* anguste obovata, unguiculata, circa 1·5 cm. longa. *Stamina* circa 2·5 cm. longa. *Legumen* oblongum, apiculatum, compressum, lignosum, circa 8 cm. longum. *Semina* 3, obovato-oblonga, compressa, nitida; testa reticulato-venosa; arillus latus, truncatus, circa 1 cm. longus, 1·2 cm. latus.

Transvaal. Barberton, *P. P. Oranje*.

869. **Pentanisia Sykesii**. *Hutchinson* [Rubiaceae-Knoxieae]; affinis *P. Schweinfurthii*, Hiern, a qua calycis tubo glabro, stipulis et calycis lobis magis foliaceis recedit.

Herba rhizomate ascendente lignoso, e basi ramosa, circa 26 cm. alta, ramis subquadrangularibus infra stipulas linea pubescenti notatis. *Folia* sessilia, lanceolata, basin versus angustata, glabra, firma, apice acuta vel obtusa, 2·5–4 cm. longa, 0·5–1 cm. lata. *Vagina stipularis* usque ad 3 mm. longa, lobis 3-5 linearibus obtusis interdum subfoliaceis 3–10 mm. longis 0·5–2 mm. latis. *Cyma* bipara, primum capituliformis, ramis mox elongatis. *Calycis tubus* glaber, circa 2 mm. longus, lobis acutis admodum inaequalibus, 1 vel 2 eorum foliaceis lineari-oblongis 5–9 mm. longis 1–1·5 mm. latis, ceteris subulatis multo brevioribus. *Corollae tubus* extra pubescens, fauce extra glabrata circa 1 mm. diametro; lobi 5, oblongo-lanceolati, 5 mm. longi, 2 mm. lati, extra glabrati, intus minutissime pubescentes (fere papillosi). *Flores longistyli*—Corollae tubus 11 mm. longus, fauce dense barbata; stamina inclusa, 2 mm. infra sinus inserta, filamentis 1 mm. longis, antheris flavis 2 mm. longis; stylus 15 mm. longus, lobis stigmaticis 5 inaequalibus corollae tubum 4 mm. superantibus. *Flores brevistyli*—Corollae tubus 9 mm. longus, fauce laxius barbata; stamina longe exserta, 2 mm. infra sinus inserta, antheris

caeruleis 2·5 mm. longis, filamentis 4 mm. longis ; stylus 8–9 mm. longus, lobis stigmaticis 3–5 inaequalibus. *Ovarium* 4-5-loculare, ovulis solitariis, pendulis. *Fructus* ignotus.

RHODESIA. Batoka Plateau, near Katomo, *F. W. Sykes in Herb. Allen*, 225.

870. **Sphacophyllum flexuosum**, *Hutchinson* [Compositae-Inuloideae] ; affine *S. Kirkii*, Oliv., a quo foliis majoribus inflorescentia laxa differt.

Planta circa 1 m. alta, ramis teretibus striatis circa 5 mm. diametro pilis moniliformibus tomentellis. *Folia* pinnatisecta, segmentis lateralibus 6–8 parvis ; rhachis usque ad 4·5 cm. longa ; segmentum terminale ovatum, obtusiuscule acuminatum, interdum subcordatum, dupliciter crenato-serratum, 8–14 cm. longum, 4–9 cm. latum, supra breviter puberulum, subtus dense breviter pubescens, basi subpalmatim 5–7-nervium, nervis utrinque praesertim infra prominulis : segmenta lateralia crenata, usque ad 15 mm. longa et 7 mm. lata. *Inflorescentia* corymbosa, circa 12 cm. longa ; rhachis flexuosa, ramis 1–3 cm. distantibus ; pedunculi usque ad 2·5 cm. longi. *Capitula* hemisphaerica, circa 1·5 cm. diametro. *Involucri bracteae* 3-seriatae, lanceolatae vel exteriores ovato-lanceolatae, acutae, minute glanduloso-pubescentes, ciliatae. *Flores radii* circa 30 ; tubus 3 mm. longus, extra glandulosus ; lamina lutea, oblonga, emarginata, 8 mm. longa, 2·75 mm. lata ; stylus glaber, ramis leviter apiculatis 0·75 mm. longis. *Flores disci* plurimi ; tubus 3·5 mm. longus ; lobi 0·75 mm. longi, extra glandulosi ; antherae 2 mm. longae ; stylus glaber, ramis apice rotundatis 1 mm. longis. *Paleae* 5 mm. longae, apice laciniatae. *Achaenia* cylindrica vel leviter costata, glabra, 1·5 mm. longa. *Pappus* annularis, minutissimus.

NYASALAND. Tuchila Plateau, alt. 1800 m., *Purves*, 87.

871. **Anisopappus Junodi**, *Hutchinson* [Compositae-Inuloideae] ; affinis *A. africano*, Oliv., sed foliis dentatis nec crenatis, pedunculis brevioribus, capitulis angustioribus differt.

Frutex 1·5–2 m. altus, ramis striatis arachnoideo-tomentellis. *Folia* lanceolata vel ovato-lanceolata, 3·5–5 cm. longa, 1·5–2 cm. lata, supra minute subtiliter arachnoideo-pubescentia, demum glabra, subtus tomentella, marginibus obtuse dentatis, venis et venulis supra leviter impressis subtus prominentibus, lateralibus utrinque 3-4 ; petiolus 7–12 mm. longus, tomentellus. *Inflorescentia* corymbosa, 2–5 cm. longa ; pedunculi usque ad 1·5 cm. longi, bracteis linearibus 5 mm. longis. *Capitula* circa 1 cm. longa et 0·5 cm. diametro. *Involucri bracteae* oblongae, obtusae, inaequales, extra dense tomentellae, 4–7 mm. longae, circa 1·5 mm. latae. *Flores radii* circa 20 ; tubus 3 mm. longus, extra minute glandulosus ; lamina lutea, oblonga, 8 mm. longa, 2 mm. lata, apice breviter trifida ; styli rami glabri, 1 mm. longi. *Flores disci* plurimi ; tubus 4·5 mm. longus ; antherae 2·5 mm. longae ; styli rami glandulosi, 1 mm. longi. *Paleae* 7 mm. longae, apicem versus pilosae. *Achaenia* sparse pilosa, 2 mm. longa ; pappi setae paucae, 1 mm. longae.

TRANSVAAL. Shilouvane, on the slopes of the mountain, *Junod*, 1279.

872. **Schizoglossum altum**, *N. E. Brown* [Asclepiadaceae]; affine *S. strictissimo*, S. Moore, sed corolla intra glabra facile distinguitur.

Caulis ad 1·4 m. altus, superne uniramosus, velutino-puberulus. *Folia* erecta vel suberecta, inferiora 4–6 cm. longa, 1–1·5 mm. lata, superiora minora, linearia, acuta, marginibus revolutis, puberula. *Umbellae* ad nodos sessiles, 2–3-florae. *Pedicelli* 2–4 mm. longi, puberuli. *Sepala* 1 mm. longa, ovata, acuta, puberula. *Corolla* rotata, extra tenuiter pubescens, intra glabra, fusco-purpurea; lobi 2·5 mm. longi, 1·25 mm. lati, ovato-oblongi, subacuti, marginibus recurvis. *Coronae* lobi erecto-patentes, 0·5 mm. longi, 1 mm. lati, transverse cuneato-oblongi, basi connati, intra bicarinati et ad apicem appendicula lanceolata acuta 0·5–0·75 mm. longa antheris incumbente instructi.

British Central Africa. Nyasaland; Ntondwe, *Cameron*, 107.

873. **Asclepias fornicata**, *N. E. Brown* [Asclepiadaceae]; affinis *A. macranthae*, Hochst., umbellis racemosim dispositis et coronae lobis differt.

Caulis superne anfractuosus, unifariam puberulus. *Folia* 5–11 cm. longa, 2–4 mm. lata, linearia, acuta, glabra vel parce puberula. *Umbellae* pedunculatae, racemosim dispositae, 3–4-florae. *Pedunculi* subaequales, plerumque 5–7 cm. longi. *Pedicelli* 3–4 cm. longi. *Sepala* 5–6 mm. longa, 3 mm. lata, ovato-lanceolata, acuta, glabra. *Corollae* lobi erecto-patentes, 1·4–1·5 cm. longi, 8 mm. lati, elliptico-oblongi, subacuti, utrinque glabri. *Coronae* lobi supra basin columnae staminum inserti et columnam excedentes, erecti, 7 mm. longi, complicato-carinati, lateraliter subalati, a tergo visi oblongi, apice rotundati, supra carinas breviter producti, basi in stipitem brevissimum abrupte rotundati, a latere visi apice 4 mm. lati, carinis superne in dentes magnos falcato-oblongos supra antheras productis et transversim marginato-alatis, dorsaliter fornicatis, intra minute papillatis.

British Central Africa. Nyasaland; Mwanemba, 2400 m. *McClounie*, 81.

Although in general appearance this resembles *A. macrantha*, Hochst, except as to the disposition of the umbels, the coronal lobes are quite distinct from those of any other species I have examined, for instead of the cavity on the inner face being formed by the inflexed sides or margins of the lobes, it is represented by a very narrow space between the two large keels on the inner face, which (in this species) take the place of the inflexed sides, and at the top on the dorsal part are connected by a narrow arching roof. The flowers appear to have been orange-yellow.

874. **Marsdenia rostrifera**, *N. E. Brown* [Asclepiadaceae]; similis *M. efulensi*, N. E. Br., sed floribus multo majoribus fusco-sanguineis facile distinguitur.

Caulis volubilis, glaber. *Folia* patentia, glabra; petiolus 2–3 cm. longus; lamina 5–9 cm. longa, 2·5–4·5 cm. lata, oblonga vel ovato-oblonga, cuspidato-acuminata, basi late rotundata vel subcordata. *Umbellae* axillares, breviter pedunculatae vel sessiles,

multiflorae. *Pedicelli* 1–1·5 cm. longi, graciles, unilateraliter puberuli. *Sepala* 2·5 mm. longa, ovata, obtusa, minutissime puberula et ciliolata. *Corolla* rotata, 1·3 cm. diam., carnosa, extra minutissime puberula, intra minute velutino-puberula, fusco-sanguinea; lobi 5–6 mm. longi, 3–5 mm. lati, oblongi, obtusi. *Coronae* lobi fere 1 mm. longi, ex toto antheris adnati, oblongi, obtusi. *Antherae* appendiculae erectae, late ovatae vel rotundatae, obtusae, apiculatae. *Stylus* longe rostratus, ultra antheras ad 3 mm. exsertus, apice acute bifidus.

Gold Coast. Aburi, in Rubber and Cola plantations, *Johnson*, 1078.

Mr. Johnson states that the flowers are "dark crimson-maroon, thick, fleshy, and smell like native 'stink-fish.'" The leaves appear to have had a shining surface.

875. **Brillantaisia Mahoni**, *C. B. Clarke* [Acanthaceae-Ruellieae]; ex affinitate *B. nitentis*, Lindau, sed foliis floralibus persistentibus basi cuneatis, sepalis 14 mm. longis, nempe 4 usque ad apicem linearibus, 1 lineari in parte superiore paullo latiore vix linear-i-spathulato.

Planta pilosa, glanduloso-viscosa. *Folii* lamina 16 cm. longa, 10 cm. lata, ovato-triangulari-elongata, basi subhorizontaliter truncata, in margine arcte acute serrata; petioli usque ad 4–6 cm. longi. *Inflorescentia* 16 cm. longa, 6 cm. lata, pauciflora, *i.e.* panicula depauperata; folia floralia usque ad 4 cm. longa, 2 cm. lata, utrinque angustata. *Corolla* subcaerulea; tubus 1 cm. longus; labia 25 mm. longa.

Uganda. Entebbe, in shady spots by water, alt. 1170 m., *Mahon*.

This species is very near *B. nitens*, Lindau, a Kamerun plant in which the floral leaves seen are truncate or subcordate at the base.

Crossandrella, *C. B. Clarke*, gen. nov. [Acanthaceae-Justicieae]; ex affinitate *Crossandrae*, a qua calyce quadripartito et inflorescentia recedit.

Calyx usque ad basin 4-partitus; segmentum posticum ovatum, emarginatum, anticum ellipticum, integrum, 2 interiora breviora, linearia. *Corolla* parva; tubus oblongus; limbus 5-lobus, unilateralis. *Stamina* 4, subsessilia; filamenta brevia, glabra; antherae 1-loculares, loculis lineari-oblongis. *Pollen* linear-i-oblongum, in medio obscure constrictum, in apice utroque quadratum, longitudinaliter costatum; pori 2.—Frutex. Folia *integra*. Spicae *terminales* 10-*florae*; *flores solitarii*; *bractea parva*, *lanceolata*; *prophylla* 2, *majora*, *elliptica*.

This genus is close to Crossandra, the stamens and pollen being the same. It differs in the 4-partite calyx, and the inflorescence which is nearer that of Sclerochiton.

876. **C. laxispicata**, *C. B. Clarke*, sp. unica. *Folia* 14 cm. longa, 4 cm. lata; oblonga, utrinque attenuata. *Spicae* 5–7 cm. longae, minute scabro-pubescentes. *Bractea* 4 mm. longa; prophylla 9 mm. longa. *Calycis* 2 segmenta exteriora 9 mm. longa, interiora

6 mm. longa. *Corolla* 10–12 mm. longa, alba (fide E. Brown) limbo unilaterali e calyce breviter exserto. *Pollen* 60 μ longum. 20–25 μ latum.

UGANDA. Mawokota, alt. 1170 m., *E. Brown*, 210.

877. **Eranthemum bilabiale**, *C. B. Clarke* [Acanthaceae-Justicieae] ; species distinctissima foliis 24 cm. longis lanceolato-obovatis subito breviter acuminatis, panicula 3–4 dm. longa lineari composita densiuscula, corollae tubo 25 mm. longo 1·5 mm. lato usque ad apicem lineari curvato, limbo subplano 15 mm. diametro conspicue bilabiali.

Planta majuscula, fere glabra, inflorescentia triramosa, quasi nudata. *Folia* 24 cm. longa, in margine undulata, omnino *Eranthemi* ; petioli superiores 15 mm. longi. *Flores* in ramis abbreviatis paniculae fasciculati. *Calycis* dentes 4 mm. longi, lineares, fere setacei. *Corollae* tubus apice vix dilatatus. Stamina 2 ; filamenta e tubi ore breviter exserta ; antherae loculi 2, paralleli, altitudine aequales, contigui, ecaudati. *Pollen* parvum, subglobosum, vix ellipsoideum, longitudinaliter 3-vittatum. *Capsula* 35 mm. longa, clavata, apice 6 mm lata, 4-sperma, stipite lineari 16 mm. longo. *Semina* complanata, glabra, verrucoso-tuberculata.

UGANDA Mawakota, alt. 1170 m., *E. Brown*, 209.

The corolla, in this complete specimen, is so strongly bilabiate that it has been proposed by a competent botanist to place this species in some remote section of Acanthaceae. The inflorescence, the stamens and the capsule are so typically of Eranthemum that I put it in Eranthemum. This I have no doubt is the true affinity, but some person may prefer to call it a genus novum.

878. **Pteris (Eupteris) intricata**, *C. H. Wright* [Filices-Polypodiaceae] ; *P. brevisorae*, Baker, proxima, frondibus ramosioribus spinosis pinnulisque latioribus recedit.

Stipes castaneus, spinosus. *Frondes* deltoideae, 90 cm. longae, basi 60 cm. latae, bipinnatae, obscure virides, glabrae ; rhachis castanea, basi 5 mm. diam., versus apicem attenuata debilisque, glabra, nitida, spinis distantibus rectis 3 mm. longis instructa. *Pinnae* infimae 50 cm. longae, basi 30 cm. latae, pinnatae ; pinnae reliquae versus apicem gradatim minores ; lobi 10–25 mm. longi, 5–7 mm. lati, oblongi, obtusi, minute serrati, lobo infimo quam ceteris multo majore ; costa venaeque subtus spinosae. *Sori* 3–8 mm. longi, parte basali loborum positi.

UGANDA PROTECTORATE. Mawakota, 1190 m., *E. Brown*, 158.

879. **Polypodium (Euphegopteris) Thomassetii**, *C. H. Wright* [Filices-Polypodiaceae] ; *P. drepano*, Hook., affine, frondibus rigidioribus esquamosis differt.

Stipes 25 cm. altus, supra canaliculatus, subtus convexus, basi squamis pallide brunneis lanceolatis instructus, alibi nudus. *Frondes* deltoideae, 40 cm. longae, 24 cm. latae, pinnatae, coriaceae, glaberrimae ; rhachis straminea, supra anguste alata. *Pinnae* fere ad rhachin incisae, lanceolatae, acuminatae ; segmenta oblongo-lanceolata, obtusa, crenulato-serrata, margine basali superiore costae parallelo, inferiore obliquo ; venae furcatae. *Sori* uniseriales, ad nervorum medium positi.

SEYCHELLES ISLANDS. Mahé, *Thomasset*, 93.

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880. **Polypodium (Goniophlebium) prionodes,** *C. H. Wright* [Filices-Polypodiaceae]; ex affinitate *P. subauriculati*, Bl., a quo pinnis basi acutis differt.

Rhizoma breviter repens. *Stipites* caespitosi, circa 20 cm. alti, 3 mm. diam., plano-convexi, glabri, basi squamis deciduis brevibus ovatis instructi. *Frondes* simpliciter pinnatae, 30 cm. longae, glabrae; rhachis gracilis. *Pinnae* anguste lanceolatae, acuminatae, basi acutae, argute serratae, 12 cm. longae, ad 1 cm. latae, nervo crasso marginali circumdatae. *Sori* parvi, irregulariter 2–3-seriati.

Uganda Protectorate. West Ankole Forest, 1530 m., on rocks in streams, *Dawe*, 369.

XLII.—THE USE OF SEEDS FOR ORNAMENTAL PURPOSES.

(With Plate.)

The use of ornamental seeds in the manufacture of household articles and for personal adornment is common in many countries, but in few perhaps has the application of natural forest seeds become an industry so definite as appears to be the case in Mazagon, Bombay. This is described in an article which appeared in the "Times of India" for July 13th, 1906, here reproduced.

This article is of interest to Kew as some time ago (May, 1905) Mr. G. M. Ryan, F.L.S., of the Indian Forest Service, presented to the Museum, on behalf of the Sisters of All Saints' School at Mazagon, a handsome screen, measuring 7 ft. by 5 ft., made up of 110 strings in the manner described.

The seeds employed in this instance were "Job's Tears" (*Coix Lachryma-jobi*, Linn.), "Red Wood," sometimes, according to Dict. Econ. Prod. India, called "Red Sandal Wood" (*Adenanthera pavonina*, Linn.), seeds of *Mimusops Kauki*, Linn., and short pieces of what appear to be the peduncles of "Great Millet" (*Andropogon Sorghum*, Brot., var. *vulgaris*, Hack.), or an allied form.

The photograph of which a reproduction is given here, illustrating the work in course of progress, was presented by Mr. Ryan with the screen.

"The Indian jungles are remarkable for the number of hard bright seeds of many colours that are found upon their trees and climbing plants. Every colour except probably light blue and bright green is represented, and these seeds, if gathered when quite ripe, are hard and durable, some being about the hardness of bone. In size they vary from that of a large watch downwards, and beyond occasional use for their real or supposed medicinal properties, they have been allowed to fall and rot where they grow unless, like the myrabolan and mhowra, they possess some commercial value for industrial or economic purposes. The beauty of many of these seeds and their durability must have often suggested their use as ornaments, as it did to Sir George Watt, Director of Economic Products to the Government of India, but the difficulty of piercing them regularly and cheaply seems to have stood in the way until

Mr. J. Wallace, Editor of the "Indian Textile Journal" at Bombay, took the matter in hand. He had been keenly interested in Oriental industries for more than twenty years, and the utilization of forest seeds seemed to him to offer the nucleus for a minor industry that might take the place of needlework in certain schools, as sewing is one of the worst paid occupations in the world. The drilling of the seeds was the first problem to be solved, and as they varied greatly in shape, appliances had to be devised that would hold them and at the same time guide the drill so that it might always pierce them in the desired manner. All the appliances had to be cheap, easily made, and repaired, and simple enough to be used by unskilled labour without undue wear. The seeds were finally held in an instrument resembling a nut-cracker with conical recesses on the inner sides which held the seeds and a hole passing through the apex of the cone, which guided the drill. These "clamps" were made of hard Indian wood in various sizes, and were arranged for drilling single or double holes through the edge, or side, or for drilling long seeds lengthways with speed and accuracy. The steel of knitting needles, piano wire, and old bicycle spokes were found to be of excellent quality for drills, and they furnished a cheap supply of material which is easily converted.

"When the tools had been reduced to practical form the work was taken in hand by the Sisters of All Saints at their school in Mazagon, Bombay, with a capital of sixty rupees and an outfit of tools presented by their friend the Editor, who became chief artificer and inspector to the new industry. Seeds were contributed in small parcels by friends, and the artistic taste of the Sisters soon produced many charming devices, including certain loops for heavy and light curtains, necklaces, napkin-rings, hat-pins, buttons, bracelets, seed partieres and screens which found a ready sale at remunerative prices. Certain of the seeds, notably the rudraksha (*Elaeocarpus Ganitrus*, Roxb.), sacred to Shiva, were bleached and dyed in brilliant colours which added greatly to their value as buttons, beads, or hat-pins. This process taxed the talent of nearly every well-known chemist in India, who generously gave their assistance free. The rudraksha is a hard spherical nut with a very rugged surface divided normally by fine slits like the divisions of an orange, but it has many varieties both in shape, size, and number of slits, and to each of these varieties special virtues are ascribed. They protect the wearer against sickness and misfortune, procure success in life, and realise all the ambitions of the Hindu. Their value of course varies with the properties ascribed to them, and they are largely sold to pilgrims who visit Benares. When found they are generally very dirty, the interstices being filled with remnants of decayed fruit which adhere strongly, but after the various processes of cleansing, bleaching, dyeing, polishing, and mounting, a remarkable transformation has taken place with a proportionate increase in value. Many of the seeds only require polishing by friction, which brings out a lustre that was previously quite unexpected.

"The first outfit of tools was soon too small and additional drills were needed. The typical machine now consists of six

small horizontal drill heads arranged along a narrow table which accommodates six drillers. The clamp holding the seeds rests upon a small adjustable bracket which supports it at the level of the drill point; and power is applied by a coolie who turns a wooden wheel at the end of the table. A cord from this wheel makes a single turn around the small pulley of each drill and returns above them to the wheel. One labourer thus serves six drills without any complication of mechanism. The drill heads will, when required, carry wheels for grinding the drills. They will also carry a hook for laying up the silk cords used in embroidery and for making the woollen girdles worn by the Sisterhood. The demand for seeds soon outran the irregular contributions of friends and acquaintances, but fortunately arrangements were soon made for a system of supply direct from the jungles. Space for a display of the work of the All Saints Sisters in the Forest Section of the recent Industrial and Agricultural Exhibition was also provided, where the industry gained a bronze medal and attracted much attention, their 'chicks' or partiers being conspicuous for their rich and harmonious colouring. Beads of special kinds have been introduced among the seeds with excellent effect, and although the number of seeds used is over 25, the list is far from complete and is constantly being added to. The resources of Burma, Ceylon, and many parts of India are still unexploited.

"The seed and bead industry is interesting for several reasons. It is based on the use of materials which were previously without value, and these materials are worked up with the aid of new tools and appliances designed expressly for them under very strict limitations as to cost and complication. The industry has become a commercial success in the hands of ladies who had no previous experience in the work, which seems to be especially adapted to the needs of industrial schools as without being very difficult to learn, it requires enough of special knowledge to protect it against the competition of careless or unscrupulous rivals whose one object is cheapness, regardless of quality. At All Saints' Home quality of work and speed of production receive due attention, and as these essentials demand that all the tools and appliances shall be kept in good order, the training of the workers is of a kind that is but calculated to correct the national habit of carelessness among them.

"Seed and bead work should take a prominent place among the small industries of India, and should serve as a model for kindred undertakings in which simple appliances are needed to increase the efficiency and productiveness of the workers. Her Royal Highness the Princess of Wales when in Bombay recently paid a visit to the Industry and made several purchases. One of her purchases was a necklace which is now named after her."

XLIII.—FUNGI EXOTICI: V.

The nine new fungi here described from material in the Herbarium at Kew include three Malayan species communicated by Mr. H. N. Ridley, Director, Botanic Gardens, Singapore; three West African species sent by Mr. W. H. Johnson, lately Director of

Agriculture, Gold Coast; two West Indian species collected by Mr. J. H. Hart, Superintendent, Botanic Department, Trinidad, and a Polynesian species obtained by Mr. D. Yeoward, Curator, Botanic Station, Fiji.

Polyporaceae.

Polystictus Ridleyi, *Massee*. *Pilei* plures basi confluentes, infundibuliformes, radiatim striatuli, concentrice plurizonati, tenuissimi, coriaceo-lenti, flexiles, pallide incarnato-grisei, 5–8 cm. diam. *Hymenium* planum e poris brevissimis, ore rotundato, 300 μ diam., dissepimentis tenuis albo-flavescentibus compositum. Basidia et sporae non visa.

Malacca. Ayer Kerok; on dead wood, *Ridley*, 149.

A very beautiful fungus remarkable for the exceedingly thin, pliant flesh. The pileus is very pale flesh-colour with a tinge of grey or lavender; the numerous narrow concentric zones are sometimes darker in tint than the remainder. Belongs to the *Perennes* group of *Polystictus*, but does not approach at all any described species.

Thelephoraceae.

Craterellus verrucosus, *Massee*. *Pileus* membranaceus, infundibuliformis, deorsum in basi stipitiformi productus, fuligineus, dense verrucosus, 3–4 cm. latus, 5–7 cm. altus. *Hymenium* inferum venoso-corrugatum, lividum. *Sporae* subglobosae, hyalinae, glabrae, 8 × 6–7 μ.

Penang. Near Penang Hill; on the ground, *Ridley*, 163.

Gregarious; with the general aspect and habit of *C. cornucopioides*, Pers., from which it differs in its smaller size, distinctly warted pileus, and smaller subglobose spores.

Hydnaceae.

Hydnum lateritium, *Massee*. *Pileus* tenuis, subinfundibuliformis, sericeus, azonus, lateritius, 1–2 cm. latus. *Aculei* sparsi, acutiusculi, apice quandoque subincisi e lateritio-fusci expallentes. *Stipes* pileo concolor, glaberrimus 1 cm. longus. *Sporae* subglobosae, hyalinae, glabrae, 3·5–4 μ diam.

Gold Coast. Aburi; among humus, *Johnson*, 107.

Entirely pale brick-red, or with the pileus sometimes darker in colour. Allied to *H. tomentosum*, Fries.

Xylariaceae.

Xylaria fibula, *Massee*. *Stromata* sessilia, pulvinata, subtus umbilicata, extus fusco-atra, opaca, minutissime granulata, intus albo-farcta, suberosa, 1–1·5 cm. lata. *Perithecia* majuscula, globosa, vix papillato-ostiolata; asci cylindracei apice obtuse rotundati, basi elongato-pedicellati, paraphysibus filiformibus obvallatis, octosporis. *Sporae* oblique monostichae, ellipsoideae, inaequilaterales, 26–30 × 8–10 μ, primo 2-guttulatae dein opace fuligineae.

Singapore. Bukit Timah; on dead wood, *Ridley*, 159.

A very distinct and remarkable species; the stroma is quite sessile, convex above, umbilicate below, hence presenting a

concavo-convex outline in section. Attached by a small point in the centre of the umbilicus. Allied to *X. tuberiformis*, Berk.

Nectriaceae.

Calonectria gigaspora, *Massee.* *Perithecia* aggregata, obovata, laevia, glabra, coccinea, 1 mm. alta. *Asci* longissimi, octospori, aparaphysati. *Sporae* oblique monostichae vel supra subdistichae, hyalinae, subfusoideae, demum 3-septatae, 90–100 × 20 μ.

West Indies. Trinidad; in channel made by the "borer" in sugar-cane, *Hart.*

Readily recognised by the peculiar form of the perithecia, and the very large spores.

Dermateaceae.

Tryblidiella tetraspora, *Massee.* *Perithecia* erumpentia, alte exserta, elliptica seu subtrigona, 2–4 mm. lata; labris, tumidulis atris, striatulis intus involutis; disco plano, rufo-fulvescente. *Asci* cylindracei, apice rotundati, tetraspori, basi attenuato-stipitati, 250 × 20 μ, paraphysibus densissimis longioribus, vertice fusco-fuligineis obvallati. *Sporae* monostichae, oblongo-ellipticae; utrinque rotundatae, triseptatae, ad septa non vel vix constrictae, brunneae dein atro-fuligineae opacae, 50 × 15 μ.

Gold Coast. Aburi; on dead branches, *Johnson*, 119.

Readily distinguished by the tetrasporous asci and the large size of the ascophore.

Melanconiaceae.

Stilbospora Cacao, *Massee.* *Stroma* subcutaneo-erumpens, corticolum, sparsum, conico-truncatum, nigrum. *Conidia* subcylindracea, olivacea, 1- demum 3-septata, ad septum subconstricta, 19–24 × 7–9 μ. *Basidia* simplica, hyalina, obverse clavulata, 40–50 × 1·5–2 μ,

Trinidad. On branches of *Theobroma Cacao*, L., *Hart.*

Allied to *S. brevis*, Berk. and Rav., a species occurring on branches of *Carpinus* in S. Carolina; differing in the much smaller conidia and the scattered habit.

Colletotrichum echinatum, *Massee.* *Maculae* indeterminatae, pallescentes. *Acervuli* laxe gregarii lenticulares, mox erumpentes, 350–400 μ diam. *Conidia* hyalina vel chlorina, cylindracea, utrinque obtusa, 22–26 × 8–9 μ, sterigmatibus cylindraceis sursum subattenuatis pallide griseis 40–50 × 8 μ suffulta; ciliis numerosissimis, rigidulis, fuligineis, cylindraceo-attenuatis, septatis, 100–120 × 8 μ.

Gold Coast. Aburi; on dead bark of unknown plant, *Johnson*, 131.

Distinguished from allied species by the coloured conidiophores and stroma, and by the numerous cilia.

Aposphaeria Canavaliae, *Massee*. *Maculae* arescenti-nigricantes, irregulares, indeterminatae. *Perithecia* superficialia, atra, glabra, ostiolo conico pertusa, contexto parenchymatico brunneo donata. *Sporulae* magnae, hyalinae, utrinque obtuse rotundatae, 24–30 × 8–10 μ, sterigmatibus cylindraceis 12–15 × 4 μ hyalinis insidentes.

FIJI. On dead pods of some species of *Canavalia*, *Yeoward*, 9.

Forming blackish patches of large size on the surface of the pod. Allied to *A. macrospora*, Sacc., differing in the somewhat smaller spores and the much longer beak or ostiolum of the perithecium.

XLIV.—TREES AND SHRUBS IN SCOTTISH GARDENS.

Ever since the middle decades of the last century—the days of the famous Oregon Association and of the collectors W. Lobb and Jeffrey—the gardens of Scotland, and more especially those of Perthshire, have been noted for their collections of conifers. Certain types of coniferous plants, especially those of West American origin, seem to find there conditions more congenial to them than almost any other part of the British Isles or even of Europe affords. No single garden or locality, I believe, will ever be found to suit all conifers. Irrespective of hardiness, their requirements are too varied for that. But a climate with no great extremes of heat or cold, with abundant moisture, and never subject to the long intense droughts such as are common in the Thames Valley, induces the luxuriant growth of a larger proportion of Firs and Spruces than any other. Such a climate a considerable portion of Scotland affords.

It is not only conifers, however, that find such congenial conditions there. The extensive seaboard of the country, the deep inlets of a sea warmed by the Gulf Stream and the large extent of mountain, all tend to make the valleys and plains of the western side of Scotland peculiarly adapted for a vegetation which prefers moisture and an equable temperature rather than heat and sunlight. The plants of Chili, of New Zealand, of certain parts of Japan and the Himalaya and of the upland valleys of Northern California are of this type. We consequently find, what may at first seem a curious anomaly, that many plants are thriving in Ross-shire which would not survive the winter in some of the wine-growing districts of France.

A visit, therefore, to a representative group of gardens in Scotland promised to be full of interest and instruction. With the aid of the Director and others acquainted with Scottish gardens, a list of fifteen private places was made and these I visited during the month of July last.

I also visited the two chief botanic gardens of Scotland—those of Edinburgh and Glasgow. The foundations of an interesting and representative arboretum are being laid in Edinburgh by Prof. Bayley Balfour, but the exposed position and the climatic conditions are, I believe, adverse to luxuriant tree-growth. A large

proportion, at any rate, of the trees are as yet in a comparatively juvenile state. The collection of rare shrubs, however, is of great richness, especially those belonging to the Heath family and such genera as *Erica*, *Bryanthus*, *Enkianthus* and *Rhododendron*. The great rock garden, which is being further enlarged, is, more than ever, a feature of peculiar interest.

In Glasgow the atmospheric conditions in the Botanic Gardens and inner parks could scarcely be worse. Conifers can hardly be grown at all and even such a tree as the Horse Chestnut is so strangely stunted as to be scarcely recognisable. The Glasgow Corporation, fortunately, under the guidance of Mr. Whitton, pursues a vigorous and enlightened policy in relation to its parks and gardens, and the number of these open spaces in the outer ring has greatly increased in recent years. The conditions here are more favourable, and the indoor gardening in some of these newer parks is particularly good, especially as regards Orchids and greenhouse plants. I do not, however, propose to discuss the gardens either at Glasgow or Edinburgh. My object is rather to draw up a few notes on the country places I visited where the cultivation of trees and shrubs is not hampered by adverse conditions. And there I did, indeed, find certain classes of trees, sometimes restricted, perhaps, in the number of species, but represented by such a number of individuals and in such magnificent size and vigour as probably no other part of the British Isles can show.

Murthly Castle.

To conifer-lovers in the British Islands Murthly has for many years been a place of extraordinary interest, and it is likely, I think, to long remain their Mecca. Remarkable as Scotland is for its conifers, in no other place, so far as I have seen or heard, do they exist in quite such magnificent profusion combined with such size, health and vigour. The grounds are situated about $2\frac{1}{2}$ miles out of Dunkeld on the beautiful slopes of Tayside, and contain about six miles of grass walks and avenues mostly bordered with splendid conifers. There is a very extensive collection of species and varieties but the dominating tree of Murthly is the Douglas Fir. There are numerous specimens ranging from 80 to over 100 feet high some of them with trunks more than 10 feet in girth. They are of many shades of colour ranging from the glaucous green of the Colorado type to the ordinary soft, more grass-like greens. Where they have been planted sufficiently near together to simulate forest conditions they have made magnificent straight, clean trunks of timber. A high opinion is held at Murthly of the durability and value of this timber. I was informed by Mr. Laurie, the gardener, that a gatepost, now in use for 15 years, was still in good condition. Planted singly, with room for lateral development, the fine contour and immense plume-like branches render this tree one of the most ornamental of all conifers.

Next to the Douglas Firs the most noteworthy of the bigger trees are *Tsuga mertensiana* (the *Abies albertiana* of Scottish gardens), *Abies grandis*, *A. nobilis* and *Picea sitchenis*. *Tsuga mertensiana*, one of which I made out to be 85 feet high, with its

tall, tapering, well-formed trunk, is one of the most beautiful of conifers and presents a remarkable difference in habit from its East American ally—*T. canadensis*—of which there is also a fine example 59 feet high but with a big, rounded, bushy head and a short trunk 8 feet 6 inches in girth. *Abies grandis*, one specimen of which girths 8 feet, grows very quickly here; trees about 20 years old are now 54 feet high. *Abies nobilis*, planted in great numbers, is one of the features of Murthly; the intense glaucous hue of its younger branches and the great crops of cones—large, stiffly upright and purple—which some trees bear near the top, make it one of the most conspicuous. One specimen I measured was 80 feet high and 7 feet 10 inches in girth. Of *Picea sitchensis* (known often as *Abies Menziesii*) one was 12 feet in girth and, approximately, 100 feet high.

Pinus monticola, of which so high an opinion used to be held at Murthly, and of which numerous excellent specimens used to grow there, has, in many cases, had to be destroyed on account of the attacks of a destructive pine-rust (*Peridermium* sp.). There is one specimen, however, which, although not quite so fine as the tree at Scone, must still be one of the finest in the country; it is 91 feet high and 6 feet 7 inches in girth.

The glaucous form of *Tsuga pattoniana*, generally known in gardens as *T. hookeriana*, is at Murthly the most beautiful of the purely ornamental conifers. Till one sees it as it is here one can form no adequate idea of its merit. There is one specimen, a pendulous variety, which is the most beautiful conifer I have seen. It is 54 feet high, the trunk just over 4 feet in girth, and its dense, gracefully pendent, plumose branches are of a silvery glaucous hue. In the sunlight, and in contrast with darker-leaved things around, it made a singularly attractive picture. It was interesting to note that seedlings raised from this pendulous variety have turned out to be true *T. hookeriana*; they have not inherited the pendulous character of the parent tree, nor have they reverted in the least towards *T. pattoniana*, of which species, as I have already intimated, *T. hookeriana* is considered to be merely a glaucous variety. A fine tree of the ordinary *T. hookeriana* has a trunk 6 feet 2 inches in girth.

Sequoia gigantea, planted in 1857, is now about 90 feet high and 12 feet 2 inches in girth. *Picea ajanensis*, the most beautiful of Japanese conifers, was 33 feet high, and *P. orientalis* 60 feet high. *Abies Veitchii*, disappointing at present as an ornamental tree on account of its thin habit, was 31 feet high.

Among rarer things were *Juniperus recurva*, the striking Himalayan species, 30 feet high and very well furnished; *Cryptomeria japonica* var. *spiralis*, not remarkable for size but showing the spiral arrangement of the branches particularly well; *Abies sachalinensis*, a very uncommon species, 16 feet high, but here, as elsewhere, not quite satisfactory; *Picea Omorica*, the Servian Spruce, and one of the most promising of recent introductions, bearing cones—the first I have heard of in Britain. There was also a healthy young plant of *Pinus pentaphylla*, 4½ feet high; this species is a native of Japan and allied to *P. parviflora*, and the Murthly specimen is one of very few in the country. In a nursery bed was a healthy batch of about 600 seedlings of *Larix*

occidentalis. Some interest is being taken just now in this Larch, a native of Western North America, as a possible substitute for the common Larch. The species is uncommon, and the best trees in the country are probably those in the pinetum at Kew; they are 25 to 30 feet high and bear cones most seasons.

Murthly has some notable Yews. Some of them are between 400 and 500 years old, and have now huge spreading heads. One has a trunk 10 feet 10 inches in circumference at three feet from the ground. There is also a huge specimen of the Sweet Chestnut rivalling in bulk the enormous trees at Studley Royal, in Yorkshire. At five feet from the ground the trunk measures 24 feet in circumference, and near the ground it is 32 feet; it has, moreover, the remarkable spiral arrangement of the trunk fissures that is occasionally seen in this tree. A specimen at Kew has this character very well marked.

Scone Palace.

The long and intimate connection of Scone with the history of Scotland and of the Scottish kings imparts a charm to the place which ancient associations always give. This charm, however, is not always felt so keenly as it is at Scone where thick woods, fine old trees, and spacious lawns are admirably in consort with its romantic history. One of the striking things about Scone, indeed, is the rich and varied character of the woods surrounding the Palace. Mixed with the ordinary deciduous trees of the country, of which there are magnificent old specimens, are numerous fine examples of Douglas Fir, Silver Fir, and other conifers which give a warm and luxuriant effect. Besides this there is, to horticulturists, the additional although minor interest of its being associated with the early years of David Douglas—one of the first and most famous of plant-collectors. He was born at the village of Scone in 1799 and received his first training as a gardener in the Palace gardens. A notable tree in the grounds is a specimen of Douglas Fir which was one of the original trees introduced by him in 1827 and planted on its present site in 1834. It is now 10 feet 2 inches in girth and only one or two feet short of 100 feet high.

The collection of conifers is grown on a piece of ground specially set apart for them. They are planted on well-kept lawns in straight lines with abundant space for the development of each. The health of the trees is excellent and the general effect imposing and not ill-suited to the formal character of the trees. Perhaps the most notable tree in regard to size in the pinetum at Scone is *Pinus monticola*. This tree in 1891 was 71 feet high; I made it to be now 93 feet high, so that in 15 years it has grown 22 feet; its girth at 4 feet was 7 feet 11 inches. I imagine this to be the finest specimen in Britain. Other fine Pines are *P. ponderosa*, 70 feet high and 7 feet 11 inches girth, and *P. Cembra*, 51 feet high. Of the Silver Firs *Abies nordmanniana* was 66 feet high and 5 feet 11 inches girth; *A. Pinsapo*, 51 feet high; *A. lowiana*, 54 feet high. There was also a beautifully coloured *A. concolor* var. *violacea*, 27 feet high. Of more than ordinary interest to me was a small but healthy young tree of *Abies Mariesii*; this species is exceedingly rare and the specimen at Scone was the only one I

saw in Scotland. The Irish Juniper (*Juniperus communis* var. *fastigiata*) made a column 20 feet high, and a specimen of the common Savin was 10 feet high and covered a space 30 feet in diameter.

Near the Palace are some immense specimens of common trees. A Sycamore (*Acer Pseudoplatanus*) said to have been planted by Mary, Queen of Scots, is still alive but somewhat of a wreck; its trunk, roughly, is about 6 feet in diameter. A gigantic *Populus deltoidea*, the North American "Cottonwood," is 15 feet in girth of trunk.

Kinfauns Castle.

The castle of Kinfauns, built on a historic site, occupies a delightful position a few miles out of Perth. It is somewhat elevated above the valley of the River Tay and behind it rises a magnificent amphitheatre of hills. The gardening here, both indoor and outdoor, is very good, the greenhouses containing for their size a better collection of well-grown plants than I saw elsewhere. The garden is a delightful spot, especially above the house, where it occupies a valley with sloping lawns running down to a brook in the middle and dotted with fine old trees. Conifers are well grown and vigorous, but not many are exceptional in size as these trees go in Perthshire. *Pyrus rotundifolia*, one of the White Beam trees native of Britain but now rare in a wild state, I found here 60 feet high, its trunk 7 feet in circumference. *Quercus Turneri* was 45 feet high—loftier than I have noticed elsewhere, and a specimen of the variegated common Oak was exceptionally well coloured. A fine Sycamore over 100 feet high and a Canadian Hemlock Spruce are also features of the place.

Leny.

Situated about one mile from Callander, and not far from the Trossachs, Leny occupies a position of great natural beauty. To botanists it is a place of more than ordinary interest in being the home of one of the fathers of Indian botany—Francis Buchanan Hamilton (1762–1829). He lived at Leny after he retired from the superintendentship of the Botanic Gardens at Calcutta in 1816, and died there thirteen years later. Some of the present walks about the grounds were planned and made by him. Leny now belongs to his grandson, Mr. Hamilton Buchanan, chief of the clan Buchanan.

The principal feature of the grounds at Leny is the "glen." This is a picturesque gorge worn out of the face of a steep hill behind the house, down which a burn pursues a rugged and tortuous course. The sides of the glen are in places so precipitous as to necessitate the crossing and recrossing of the stream several times. Along its banks have been planted numerous beautiful trees and shrubs now in luxuriant growth. Perhaps the most noteworthy of these are two Himalayan Rhododendrons—*R. barbatum* and *R. Thomsoni*—both of which are now 25 feet high. From their immense size, it is not improbable that they were raised at Leny from seeds sent to Francis Hamilton about 1819 by Wallich, his successor at the Calcutta

Botanic Garden. If so, they must be the oldest in the kingdom. Among other things of interest are fine specimens of Canadian Hemlock Spruce—*Tsuga canadensis*—one of which has a trunk 7 feet 2 inches in girth. Another good specimen is growing most picturesquely on the edge of the gorge, whose precipitous side it overhangs, evidence of how much the climate favours the growth of such trees, for its roots appear to be embedded mainly in the rock. *Tsuga mertensiana*, the common Silver Fir and Douglas Fir, are represented by fine healthy specimens, although not so large as one sees in other parts of Perthshire. Here also is growing what I think is the finest specimen I have seen of the cut-leaved Beech—*Fagus sylvatica* var. *heterophylla*. It has a trunk just over 7 feet in girth and it is 70 feet high.

Dunkeld.

No true arboriculturist would pass Dunkeld for the first time without making a pilgrimage to the two famous so-called "parent" Larches standing near the old cathedral. They are the survivors of five trees planted there in 1738 by the then Duke of Atholl. It is a matter for regret that one of them is now dying, having, it is believed, been struck by lightning. The dimensions of the other are given on a tablet at its base :—Height, 102 feet ; girth at 3 feet, 17 feet 2 inches ; girth at 68 feet, 6 feet 1 inch. Near the house are several other magnificent Larches, scarcely, if at all, inferior to this—one in particular was noticeable for its enormous bulb-like base, 8 feet in diameter.

Dunkeld is the original home of the Larch in Britain in more senses than one. It was here that the first plantations on a large scale were made, and the names of successive Dukes of Atholl in the 18th century will always be remembered as the pioneers of this branch of forestry. According to Hunter, in his "Woods, Forests, and Estates of Perthshire," plantations of 27 millions of Larches were made by the fourth Duke alone—still known as "The Planter."

As is well known, Dunkeld is situated in a district of singular natural beauty, and the grounds are amongst the loveliest in Scotland. Lofty precipitous hills rise around them, and a charming grassy walk, broad and closely mown, winds by the side of the rushing Tay. The collection of conifers is being added to, but the number of species represented by unusual specimens is not great. The common Silver Fir, however, is in magnificent condition, one of them is estimated to be between 140 and 150 feet high. At Kew this tree can only be kept alive for a few years. There is also a fine *Thuya dolabrata*, 20 feet high, and not showing its usual disposition to become thin and lanky at the top. Of numerous well-grown hardy shrubs I noted *Kalmia latifolia*, 9 feet high and 12 feet through, finely in flower, and *Viburnum prunifolium*, 20 feet high.

Blair Castle.

This is another of the seats of the Dukes of Atholl, and, like Dunkeld, is one of the most beautiful places in Scotland. The gardens are picturesque, with fine views and very pretty avenues and drives, and to the west of the castle there is a magnificent

gorge and a waterfall. An avenue of Silver Birch is so delightful that one wonders this tree is not more often used for minor avenues. The kitchen garden, too, is, I think, the most charmingly situated of any I have seen. It covers the opposite slopes of a valley, the bottom of which is filled by a large piece of water with islands in it. The grounds are furnished with many fine trees, but in size these are not equal to others elsewhere mentioned in these notes. There are several Larches here said to have been planted, like those at Dunkeld, in 1738. A most noteworthy tree is a specimen of the distinct and elegant *Abies magnifica*, 60 feet high, and in perfect health and form. *Abies nordmanniana*, planted by Her Majesty Queen Alexandra in 1872, is 45 feet high; and *A. nobilis*, planted by her six years later, is the same height. Both here and at Dunkeld *Larix leptolepis* is thought to be a promising forest tree. A plantation of this species mixed with a few others is making excellent growth; the trees were planted 17 years ago and some already girth over 2 feet.

Inverewe, Ross-shire.

The house of Inverewe was built by Mr. Osgood H. Mackenzie in 1864 on what was then a bare hillside clothed with nothing bigger than heather and bracken. It is now surrounded at the back and sides by thick woods, 60 feet and more high, and gives an excellent example of what can be done, and what results obtained, in one man's lifetime—and he still in hale middle life. Mr. Mackenzie's garden, although not a large one (it is worked I believe by one or two men), has in recent years acquired a reputation as being one of more than ordinary interest. It is situated within a short distance of Poolewe, on the shores of Loch Ewe, and in the great parish of Gairloch, Ross-shire. It is, consequently, in a latitude 20 to 30 miles farther north than that of Inverness. Yet there are growing here in great luxuriance trees and shrubs from Chili, New Zealand, South Africa, and the Himalaya, which near London have to be grown under glass. The climatic conditions, therefore, must be very similar to what obtain in S.W. Ireland and Cornwall, although no doubt the mean annual temperature is considerably lower.

In approaching the house one is struck by the number of *Eucalypti* sprinkled on the outskirts of the wood. They are mostly *E. coccifera*, and although but 10 years old are now 35 feet high. An interesting experiment might be made in this or some similar part of the country by planting an acre or two of this *Eucalyptus*, *E. Gunnii* and *E. urnigera*, under forest conditions. Nothing, except perhaps Poplar, could be got to grow faster, and the reproduction of an Australian gum-tree forest on even a small scale would be particularly interesting. It is also not improbable that the timber would prove of some value.

Mr. Mackenzie's rarer shrubs are planted in clearings of the plantations near the house. They are consequently well sheltered. Among Himalayan plants a representative lot of Rhododendrons have been planted, but although very healthy they are yet small. *Buddleia Colvillei*, however, the finest of all the Buddleias, was in flower. Since this species flowered for the first time in the

British Isles with Mr. Gumbleton, near Cork, in 1892, it has done so in several other places in Ireland and England, but Inverewe must be one of the first places where it has flowered in Scotland. It was growing quite in the open.

There is a goodly number of New Zealand and Tasmanian plants here too, and a suggestive indication of the character of the climate is afforded by the way they thrive. Veronicas, for instance, are coming up over the place from naturally sown seed, and *V. salicifolia* is 7 feet high. Rich as Scotland is in her conifers one would scarcely expect to find *Podocarpus Totara*—the "Totara" of New Zealand, and perhaps the most valuable of its timbers—growing out of doors. Yet here it is in perfect health. A plant of *Billardieria longiflora*, 8 feet high, and trained up a tree trunk, was very prettily in flower, but it is even more attractive when followed by the crop of bright violet-blue berries. *Olearia Traversi* and *Leptospermum lanigerum* were both 8 feet high, and *Correa alba*, on a wall, was 6 feet high. *Olearia macrodonta* has, I believe, been very fine this year in Ireland and other mild districts. A fine bush, 14 feet in diameter, and some smaller ones were simply masses of white flowers.

Of Chilian shrubs I noted the following :—*Lomatia ferruginea*, often known as *L. pinnatifolia*, very healthy (I learnt that in another Ross-shire garden it was 10 feet high); *Mutisia decurrens*, the rare climbing composite, in good condition; *Abutilon vitifolium*, 10 feet high, and flowering freely; *Azara Gilliesii*, *Escallonia pterocladon* (very charming here as elsewhere in Scotland), *Cestrum elegans*, *Tricuspidaria*, *Eucryphia cordata*, *Desfontainea spinosa*, and Fuchsias as hedge plants.

Of species from the Cape of Good Hope, *Phygelius capensis*, a bush 7 feet high, and a very healthy *Freylinia cestroides* were the most noteworthy that I saw.

Drummond Castle.

The ancient seat of the Earls of Perth is about three miles out of Crieff, being set on an eminence and approached by a long narrow avenue of Beech and Lime. It is now one of the seats of the Earl of Ancaster, but the present residence is a modern building quite separate from, but close to, old Drummond Castle. This latter building (or, rather, what remains of it) is still in perfect repair, and from its highest tower a glorious view is to be had : mountain in the distance, wooded country and loch nearer, and, close beneath, the unique formal garden of Drummond. This garden, which is of an imposing and elaborate design and admirably kept, was originally planned and carried out in 1703 by a former proprietor and his gardener named Kennedy. The original design has been maintained for over 200 years although additions have been made. The beds and masses are in geometrical form—triangular, circular, &c.—and they are largely filled with shrubs of various sorts kept low and flat, whilst the paths are bordered with a variety of shrubs clipped into narrow, columnar shape. These columnar trees are as good as any of the kind I have seen ; they are now 80 years old, in excellent health and perfectly

furnished. The plants used are Box, Yew, Purple Oak, Fern-leaved Oak, *Thuya occidentalis*, and the golden and silver varieties of Holly. The effect of the whole is impressive, especially when seen from the castle on its abrupt eminence above. This was, no doubt, the point of view of the original designer, for, like all examples of this type of gardening, it is the view as a whole that constitutes its chief *raison d'être*. Seen in detail, its lack of variety, the absence of light and shade, and its general monotony are apt to weary.

But the formal garden, whilst the chief feature at Drummond Castle, is not the only one. The fine yews planted in 1703 are now enormous specimens with trunks 8 to 10 feet in circumference, and both conifers and " hardwoods " grow finely here. Wherever one goes in Perthshire one hears about the great storm of November 17th, 1893. Patriarchal trees that had withstood the gales of centuries succumbed that night and whole plantations were levelled as if the trees had been so many nine-pins. Evidences of this terrible storm are to be seen even now in many parts of the country—uprooted tree stumps, decaying prostrate trunks, and bare hillsides. At Drummond a noble *Abies pectinata* was blown down, but the stump, 3 or 4 feet high, still stands where it grew. It shows that the tree was 210 years old and that its trunk was 6 feet 6 inches in diameter ; it contained 1,010 cubic feet of timber. This must have been nearly, if not quite, the largest common Silver Fir in Britain of which there is any record. An enormous Beech near by was seriously injured by the same gale ; the trunk of this tree girths 19 feet 5 inches at its narrowest. Many other trees are in good condition here, but are not so notable as those seen elsewhere and mentioned in other parts of these notes.

Abercairney.

This place is about 4 miles out of Crieff and is situated in an undulating well-wooded park. The planting of the coniferous trees was done mainly about 40 years ago, and the growth being particularly good some fine specimens are now to be seen. Taking first the Silver Firs : *Abies nordmanniana* is 63 feet high ; *A. concolor*, 65 feet high and 5 feet in girth (a big specimen) ; *A. cephalonica*, 75 feet high ; *A. grandis*, 90 feet high and 10 feet in girth ; these splendid trees were all in perfect health and shape. A good specimen of *A. pectinata* girthed 15 feet 9 inches. The most interesting Spruce was *Picea orientalis*, 63 feet high. The Tsugas, too, were admirable : *Tsuga mertensiana*, 84 feet high ; *T. pattoniana*, 40 feet, and its glaucous variety (*T. hookeriana*) 30 feet high. Of the Pines I was most struck by *Pinus Cembra*, 63 feet high and 5 feet 7 inches in girth. A tree of *Larix leptolepis* was interesting as showing the rate of growth of this tree in Scotland ; it was planted 23 years ago and is now 42 feet high. The Irish Juniper (*J. communis* var. *fastigiata*) makes here a rigid column 20 feet high and 3 feet through. These figures show that, although the dimensions of some of these trees are exceeded elsewhere, the general level of excellence is exceptionally high.

Ochtertyre.

Ochtertyre is situated about 2½ miles out of Crieff in a large, picturesquely hilly park, from which fine views of the surrounding country can be obtained. The garden has long been famous for its conifers, and probably no locality, even in Scotland, is better adapted to the cultivation of a large number of evergreen trees and shrubs. Much of the present attraction that Ochtertyre has for tree-lovers is due to the late Mr. Geo. Croucher, who was gardener there for 45 years under Sir Patrick Keith Murray and his father. He planted most or all of the rarer trees.

A feature of special interest is the number of garden varieties of conifers. Of the Douglas Fir, for instance, there is the finest specimen in the country of the variety *Stairii* ; it is 39 feet high, well furnished, and of a pale greenish yellow which is not only distinct, but ornamental. Of the Golden Douglas Fir, a rare variety, there is an admirable tree 40 feet high, and the very glaucous variety is represented by a specimen of the same size in perfect health and colour. The Golden Scots Pine, *Pinus sylvestris* var. *aurea*, is here a big bush 16 feet high and as much in diameter ; this variety has the curious habit of assuming its highest colour in winter, turning greener as summer approaches. The glaucous variety of *Picea Engelmannii* is 25 feet high, and the golden variety of *Cupressus pisifera* (commonly known as *Retinispora plumosa aurea*) is 18 feet high, 15 feet in diameter, and in excellent colour.

Turning to the species themselves, *Picea ajanensis* impressed one by its magnificent health and the vivid blue-white colouring of the lower surface of its leaves, which is not surpassed, I think, by that of any other plant in cultivation ; one specimen was, approximately, 45 feet high. *Saxegothea conspicua*, a curious conifer with some affinity to the Yew, introduced from Chili in 1847, is now very rarely met with ; it is, however, in fine condition at Ochtertyre, a plant being 12 feet high and 8 feet through. The Silver Firs have the usual rude vigour of these trees in Perthshire, a specimen of *Abies cephalonica* being unusually fine. I was unable to take its height, but its trunk was 8 feet in girth. Then *A. magnifica* I saw 70 feet high and finer than elsewhere. This species is much less common than its ally, *A. nobilis*, one of the most frequent of purely ornamental conifers in Scotland. At one time these two species were confused, but seen in the adult stage they are very distinct, *A. magnifica* being denser in habit and much more slender and tapering in form. *Picea Morinda* had a trunk 8 feet 8 inches in girth and was 66 feet high, and of the common Spruce I saw a tree 120 feet high.

It is not only the conifers that thrive so well at Ochtertyre, some of the ordinary evergreens are very good also. A specimen of Portugal Laurel, for instance, was 30 feet high and 50 feet through ; *Ilex crenata*, 7 feet high ; *Rhododendron dauricum*, 8 feet high ; *Pieris floribunda*, splendid bushes, 10 feet through.

Monzie Castle.

This place, which is about three miles out of Crieff, I visited in a persistent downpour of rain. Although it has not much of

unusual interest to arboriculturists, it is worth visiting for the sake of its three enormous Larches. These are planted together in a row, and are said to be of the same age as the more famous trees at Dunkeld, and to have been planted a few days earlier. The largest of them I made to be 108 feet high and 17 feet 6 inches in girth ; it is, therefore, about equal to the greater of the Dunkeld Larches. Of other trees I noted *Populus deltoidea*, 120 feet high, and the common Birch, 84 feet high. New to me as a hedge plant was the Douglas Fir ; it answered the purpose, however, very well, being dense and well furnished.

Dalkeith Palace.

The gardens of Dalkeith have long been known as among the leading ones of the United Kingdom. Managed by a succession of famous gardeners, they have constituted a school of horticulture from which many noted men have been sent out. One reason of this is that the place is what may be termed an "all-round" one, where neither the kitchen garden, the flower garden, nor the hothouses absorb more than their due share of the attention of the staff, but all are good. For this reason the trees and shrubs, though they constitute a very interesting collection, do not predominate as they do in other famous places I visited. The climate is considerably drier than that of Perthshire, consequently the growth of many conifers, more especially Firs and Spruces, is not so luxuriant as it is there. Still, I found the Himalayan *Juniperus recurva*, a fine bush 14 feet high and through, and there are three fine old Cedars, one of which girths 13 feet 9 inches. *Ginkgo biloba* is represented by one of the fine specimens of this country, 50 feet high and very healthy, as are *Abies Veitchii*, 20 feet high, and *Picea pungens*, 18 feet high.

Many years ago the varieties of the Scotch Rose (*R. spinosissima*) were very popular in gardens. Most of them are now almost lost to cultivation, and it was, therefore, a pleasant surprise to find a collection here of about ninety varieties got together by a former Duke of Buccleuch in the early part of the nineteenth century and still carefully guarded.

Among the trees, mention should be made of a very fine weeping Ash, 50 feet high ; *Ilex dipyrena*, 20 feet high ; and a remarkable old specimen of Laburnum, low, and spreading in habit, and covering a piece of ground 60 feet across. To one whose lot is cast in the south one of the notable differences in the ordinary vegetation of Scotland from that of the south of England is the predominance of the Scotch or Wych Elm over the common *Ulmus campestris*. In the south the Wych Elm is comparatively rare. Here at Dalkeith is the noblest specimen I have ever seen ; it is 125 feet high, with a clean trunk girthing 13 feet 9 inches at 4 feet from the ground.

Smeaton-Hepburn.

The garden of Sir Archibald Buchan-Hepburn at Smeaton in Haddingtonshire is more to the eastern side of Scotland than any other I visited. The growth of the trees and shrubs, however,

appeared to me to be quite as luxuriant as in Perthshire, the proximity of the North Sea and the Firth of Forth, I suppose, accounting for this. The conifers were especially good, some of them better than I saw elsewhere. *Cupressus macrocarpa*, 72 feet high and 7 feet 6 inches in girth, was finer on the whole than any other I met with, though one on Sir Herbert Maxwell's estate almost rivals it. *Sequoia gigantea*, said to have been received from Kew as a small plant soon after the species was introduced, is now 90 feet high and girths 13 feet 6 inches. Its ally, *S. sempervirens*, was 66 feet high and 9 feet 3 inches in girth, and therefore about the same size as our biggest Kew specimen. *Tsuga canadensis* has the big bushy head characteristic of the tree in Scotland, 40 feet through. *Abies nobilis* is represented by a noble specimen approximately 100 feet high, with a trunk 8 feet 10 inches in girth. *Picea Morinda* was 72 feet high and 7 feet 9 inches in girth. *P. sitchensis*, of which I saw elsewhere such large trees, is here almost as fine as anywhere—90 feet high and 10 feet 4 inches in girth; as an ornamental tree, however, it has one frequent defect, the centre of the tree being filled with dead branches and twigs which the outer fringe of living growth is not dense enough to hide. Other trees finely represented were *Pinus excelsa*, *P. insignis*, Douglas Fir, *Abies Pinsapo*, and *A. grandis*, all girthing about 8 feet. A good specimen of the cut-leaved Oak, *Quercus pedunculata* var. *heterophylla*, was 54 feet high. Of big shrubs, I noted *Neillia opulifolia*, 30 feet through, and *Spiraea discolor*, 20 feet high.

Monreith.

Monreith is situated near the end of the promontory in Wigtownshire that juts out towards the Isle of Man, between Luce Bay and Wigtown Bay. Being almost on the extreme south-west of Scotland, with water on three sides, the climate is necessarily mild and moist, and suited to many forms of tree and shrub growth. How rapidly some of these grow will be seen from the following notes. Monreith is the home of Sir Herbert Maxwell, who, among his many interests, regards forestry, I believe, as not the least.

Pinus insignis, planted in the winter of 1883–4, is now 65 feet high, its growth clean and erect, and that of a single year sometimes over 4 feet in length. *P. monticola*, planted in 1875, is 63 feet high and 4 feet 5 inches in girth. *Cupressus macrocarpa*, planted less than thirty years ago, is 60 feet high, with a trunk 7 feet 5 inches in girth—a model of health and vigour. These three trees are perhaps the most notable examples of rapid growth, but other evidences of the generous climate are to be seen in the fine trees of *Thuya gigantea*, *Juniperus virginiana*, *Cupressus nootkatensis*, *C. sempervirens*, and *Abies nobilis*. In some plantations of Scots Pines and Larches made by Sir Herbert a few years ago it was interesting to note that a few specimens of the Japanese *Picea ajanensis* were making the best headway, the "leads" of some this season being already over 2 feet long. *Abies nordmanniana*, although it evidently grew well in its early days, has proved a failure owing to the attacks of a scale insect and of a fungoid pest—*Peridermium elatinum*—which causes curious gouty, barrel-shaped protuberances on the branches.

There is a charming old-fashioned garden attached to the house where are growing some striking shrubs. I noted *Rhododendron barbatum*, *Chionanthus virginica*, 10 feet high and as much through, and *Olearia Haastii*, 9 feet high and 15 feet through. *Lilium giganteum* is perfectly at home here; one spike I saw carried twenty flowers.

Castle Kennedy.

Castle Kennedy is close to Loch Ryan, in Wigtownshire, and a long way to the south-west of Perthshire. The climate, whilst equally moist, is considerably warmer, and a different class of trees and shrubs is growing here. Escallonias, for example, especially *E. macrantha*, thrive as well as they do in Cornwall, and are evidently held in about the same esteem as Laurels in less favoured places. Callistemons were flowering freely, and *Eucalyptus Globulus* was 35 feet high. *Olearia macrodonta*, which I saw so fine at Inverewe, in Ross-shire, was here equally good. The prevailing type of Rhododendron is Himalayan, either the pure species (especially *R. arboreum*, *R. Thomsoni*, and *R. campanulatum*) or hybrids in which their "blood" predominates. A further evidence of the character of the climate was afforded by *Richardia aethiopica* growing in an open pond, and flowering freely.

I should think Castle Kennedy is one of the best watered inland demesnes in Britain. The gardens are situated chiefly on a neck of land between two lochs known as "Black" and "White" respectively, and there are several ponds and minor pieces of water besides. From a landscape point of view, one of the remarkable features of the place is the amount of terracing that has been done. Many of the natural mounds and hollows have been squared and trimmed, the slopes made into terraces, and the ponds rounded. There are also formal elevated mounds from which good views of the gardens and lochs are to be seen. This kind of landscape art was more to the taste of a bygone time than it is to that of the present day. When newly done, its aspect must have been crude and hard, but the softening hand of time has done much to ameliorate its hard lines, and where an arboreal vegetation does not grow, a thick, well-kept turf covers it all. We may say of this phase of Castle Kennedy, what applies equally well to the formal garden at Drummond, and to the topiary work of Levens: one may not care to copy it, but it is in its way unique, and one would be sorry were it to be destroyed.

Here, as in so many Scottish gardens, the conifers are the chief objects of interest. *Araucaria imbricata* is very fine, and produces cones regularly; there is a striking avenue of large specimens, one of which (it may not have been the largest) had a trunk 7 feet in girth. Equally striking to me, and less bizarre in its effect, was an avenue of *Cupressus macrocarpa*; one of the tallest was 60 feet high; another, branching low, was 9 feet 8 inches in girth at two feet from the ground. I saw many excellent specimens of various Silver Firs: *Abies webbiana*, girthing 6 feet, with its naturally sown seedlings springing up around; *A. nordmanniana*, also self-sown; *A. cephalonica*, 63 feet high and 9½ feet in girth; the rare Himalayan *A. Pindrow*, 60 feet

high and 4 feet 5 inches in girth ; the still rarer *A. religiosa*, from Mexico (the only specimen I saw in Scotland), 40 feet high ; *Picea polita*, 20 feet high, well-furnished and well-formed ; and *Cryptomeria japonica*, 50 feet high, with the unusual girth of 6 feet 3 inches.

The Holm Oak is not so fine individually here as it is at Kew, but a grove of forty of them gave one an idea of the "Ilex" woods of Southern Europe. I have already alluded to the Rhododendrons, but all the ericaceous plants are remarkably well-grown. *Pieris floribunda* was 10 feet high, the scarce *P. mariana*, 7 feet high and through, *Kalmia angustifolia*, 6 feet high, Cassandras, 4 feet high, and many more equally notable.

W. J. B.

XLV.—MISCELLANEOUS NOTES.

C. B. Clarke.—Mr. Charles Baron Clarke, M.A., F.R.S., eldest son of the late Mr. Turner Poulter Clarke, J.P., of Andover, Hampshire, who died on August 25th, 1906, had been for many years intimately associated with the Herbarium at Kew, where he was employed, as an Indian officer on special duty, from March, 1879, till April, 1883, in assisting Sir Joseph Hooker to prepare the *Flora of British India*. When he retired from the service of the Government of India, in June, 1887, he settled at Kew in order to be near the Herbarium, in which he has been a volunteer for the past 19 years, associating himself in the most wholehearted manner with the interests of the establishment and the furtherance of its work. By the members of the staff, whom he treated as friends and colleagues, and by visitors to the Herbarium of every nationality, his death will be felt as a personal loss. The extreme unselfishness and unfailing kindness with which, sometimes it is to be feared at the expense of his own special studies, he placed at the disposal of other workers his extensive knowledge of the flora of India generally and his minute acquaintance with certain natural families, particularly the *Cyperaceae*, with regard to which he was the recognised authority, can never be forgotten.

After having been at King's College School, London, Mr. Clarke proceeded to Cambridge, where he was a member of Trinity College and afterwards of Queen's. When he graduated in 1856 he was bracketed Third Wrangler ; in the following year he was elected a Fellow of Queen's College. In 1858 he was called to the Bar at Lincoln's Inn and appointed Mathematical Lecturer of his college. He was thus occupied till 1865, and in 1866 he left for India to join the Educational Department in Bengal, where he served as one of the staff of the Presidency College, Calcutta, and afterwards as an Inspector of Schools. From 1869 till 1871 he acted as Superintendent of the Royal Botanic Garden at Shibpur, near Calcutta, afterwards reverting to the Educational Department, to the first grade in which he was promoted in March, 1876. In 1877 he returned to Europe on two years' furlough. In 1879, as already stated, he was placed, when his leave expired, on special duty in England. Returning to India in 1883, he was, in

December, 1884, appointed officiating Director of Public Instruction in Bengal. In March, 1885, he was transferred as Inspector of Schools to the province of Assam, where he served till his retirement at the age of 55 in 1887.

Mr. Clarke early developed an inclination towards field-botany. While at Cambridge he paid several visits to the north of England, some to Scotland and to Switzerland, and one, in 1862, to Madeira. During most of these excursions, as his private collections show, he collected plants largely, but his principal field was North Hampshire, his own country. Before leaving for India he had prepared a list of the plants of his birthplace, Andover, which he printed in Calcutta in 1866. As an Inspector of Schools he had ample opportunities during his official tours for studying the vegetation of the plains of Bengal. He supplemented these by vacation journeys to other parts of India. His temporary connection with the Royal Botanic Garden at Calcutta enabled him to study the material in the Herbarium attached to that institution, but the pressure of official and administrative duties left him less time for sustained botanical work than he would have wished, and he occasionally complained that he was able to do less real botanical work during a year of this superintendentship than he could accomplish in a month in his travelling appointment. His herbarium work during this period did, however, lay the foundation for at least two of his published works, those on the Indian *Cyrtandraceae* and on the Indian *Commelynaceae*, published in 1874. At this time too he worked very thoroughly through the Indian *Urticaceae*. It may serve a useful purpose if a brief epitome of Mr. Clarke's various Indian journeys be given here.

Mr. Clarke was at first appointed to the Eastern Bengal School division, where the only practical mode of conveyance is by boat. During the wanderings of two and a half years he made extensive collections, which reached more than 7,000 numbers. At this time he appears to have paid particular attention to the *Commelynaceae* on which he made critical observations. Early in 1868 he lost the whole of his collections from Eastern Bengal owing to the wreck of his boat. Not at all discouraged, in May of that year he was again collecting in Sylhet, and in September he was able to pay a visit to the Madhopur jungles in Western Mymensingh, an interesting tract where low hills, densely covered with a forest unlike that of the adjacent plain, crop up through the Bengal alluvium. In August, 1869, he paid his first visit to Sikkim, but was too closely engaged on his work at the Cinchona plantation to be able to do much collecting. In October, however, he was able to make a rapid march from Darjeeling to the Yakla, a pass near but somewhat to the south of the Chola. Duties connected with the Cinchona Department took him to Southern India in March, 1870, when he was able to make a considerable collection in the Nilgiri Hills. In 1871 he was again in Sikkim but with little time for collecting.

On reverting to his work as Inspector, we find that in September, 1871, Mr. Clarke was botanising in Comilla, his field numbers now exceeding 14,000; in February, 1872, he was collecting in Barisal and the Eastern Sundribuns; in April he was

botanising in the Dacca district, and in December was investigating the vegetation of Cachar. In February, 1873, he paid a botanical visit to Chittagong; Calcutta now became his headquarters, and in 1874 we find that he paid his first visit to Chutia Nagpur, and that he spent six weeks in the Punjab Himalaya, mainly at Dalhousie, whence he was able to make excursions at least one of which was to an elevation of 10,000 feet. On his return to Calcutta he paid a visit to the Western Sundribuns. In 1875 he was transferred to the Northern Division, with his headquarters at Darjeeling, but before leaving Calcutta we find that he made a special study of the genus *Leea*. From Darjeeling he made a botanical excursion along the Nepal frontier to Tonglo, and as he had already been at the Chola to the east, in October, 1875, he visited Jongri, going by way of Pemionchi and Yoksun, returning by Singalelah. Immediately on his return from Jongri he paid a brief visit to British Bhutan east of the River Tista. The next three months, from November, 1875, to February, 1876, were spent touring in the plains of North Bengal. By this time the *Cyperaceae* and *Gramineae* had become his favourite natural orders. On returning to Darjeeling he had an opportunity of paying a spring visit to the higher passes, going to Tumloong and on to the Chola, crossing from there, keeping to the west side of the ridge, the head of the Northern Yakla into the head of the South Yakla, thence down to Dikeeling, thence across to Rhenok in British Bhutan. Owing to the snow still lying deep on the passes this journey, an official one, was not very productive as regards high elevations; rather lower down he was able to give especial attention to the Rhododendrons. On June 19th, 1876, Mr. Clarke started from Darjeeling on his longest and most arduous journey. He had three and a half months at his disposal and arranged to devote them to an examination of the flora of Kashmir. He entered that country by the ordinary high level road from Bhimpur to Srinagar, then went north by the Woolar Lake, straight across the Devil's plain to Iskardo. Crossing the Indus he went from there north into the Karakoram Mountains going as far as the great Bardomail glacier and getting well into High Asia, crossing one pass at over 17,000 feet and on several occasions reaching the highest limits of phanerogamic vegetation. On his return journey, Mr. Clarke passed near Dras into the Tilail valley, then crossed at right angles in succession the valleys of the Sind, Liddar, Jhelum, Wardwan and Ravi rivers to Amritsar. During the whole of this journey Mr. Clarke was, almost for the first time in his life, more or less unwell. After returning from this journey he spent the following cold weather touring in the northern part of Bengal; at the commencement of the hot season of 1877 he left for England on long furlough; he paid a short visit to Italy on the way home. On reaching England he settled down at Kew, his first attendance at the Herbarium there was on June 9th, 1877. He made over the whole of his collections to the Herbarium at Kew. This donation is referred to in the *Kew Report* for 1877 in the following terms:—

"The Indian Herbarium of Mr. C. B. Clarke, which is a most "munificent addition to our already unrivalled collections "illustrating the flora of our Indian Empire. This herbarium "contains 25,000 numbers, representing about 5,000 species. It

" was collected in the following provinces :—Plains of Bengal, " Khasia, and Chittagong hills, Chota Nagpore, Dalhousie and " Chumba, Kashmir to the Karakorum, Nilgheries. It contains a " large number of field-notes, the exact locality and elevation of " every plant, and some rough botanic analyses."

On returning to India—he reached Calcutta on 2nd April, 1883—Mr. Clarke was appointed Inspector of Schools at the Presidency with his headquarters at Calcutta. In the beginning of October he left for Chutia Nagpur where he made a ten weeks' march in the course of which he ascended Parasnath, and was able to get as far as Sirguja, a native state in south-western Chutia Nagpur, bordering on the upper Mahanaddi, where the plateau reaches an elevation of from 2,000–4,000 feet. Early in 1884 he paid brief botanical visits to various parts of Central Bengal, but his movements were hampered by his having to take up the duties of Professor of Mathematics at the Presidency College, Calcutta, owing to the death of the permanent incumbent. He was in October able, however, to make a journey of 26 days' duration in Lower Sikkim and in the Terai and the Duars, but his College duties disappointed him of an opportunity that had offered of accompanying a political mission which proceeded through Northern Sikkim to the Tibet frontier. His transfer to Assam in 1885, where as Inspector of Schools his headquarters were at Shillong, afforded Mr. Clarke opportunities of adding considerably to his collections from the Khasia and Jaintea Hills. Early in 1885 he was able to pay a visit to Upper Assam, reaching Dibrugar and Sadiya, and getting as far as Namchung in the Eastern Naga Hills at an elevation of 3,000 feet, by a route parallel to Griffith's Namrup route. In August he was able to pay a visit of 10 days' duration to the Kollong Rock and Nungklao, a locality rendered classical by reason of the investigations made there by Hooker and Thomson. In September, 1885, he paid a botanical visit to Cherrapungi, and on the last day of the month he set out for the Angami Naga country. His route lay through the Nambar Forest to Kohima. From Kohima he was able to ascend Japvo, the highest peak, 9,890 feet elevation, of the Bareil range. Thence he went to Manipur, an independent State between Assam and Burma, returning to Shillong by way of Silchar early in 1886. Almost immediately after his return he set out on a three months' tour, mainly in Lower Assam, and was able to make several subsequent collecting journeys before he finally left Assam and India in 1887. The collections accumulated during the second portion of his Indian service were presented to Kew after his return to England.

It will be seen therefore, that during his service in the East Mr. Clarke was able to obtain a personal knowledge of the vegetation of India comparable in extent with that acquired by Hamilton or Wallich or Hooker and second only to that attained by Griffith.

Mr. Clarke was an admirable collector; his specimens are rarely incomplete and are always carefully selected and prepared. They are accompanied by clear and often full field-notes always given on the actual field-ticket, sometimes accompanied by rough analyses made at the time of collecting. Every gathering

has a distinct number so that an erroneous citation is an impossibility; those who have travelled in his company tell us that the collections of a particular day were invariably dealt with before he retired to rest for the night, no matter how long the march may have been or how arduous the conditions under which it was made. Throughout his life he paid little attention to trees; as a collector of herbaceous plants and of shrubs he has perhaps never been surpassed.

Prior to and during the period of his deputation in England Mr. Clarke published a number of papers on botanical subjects in the *Journal of the Linnean Society* and the *Journal of Botany*, almost exclusively relating to Indian plants. Here, however, our chief interest centres in what he prepared at and on behalf of Kew. During the time he was on furlough in England (1877–79), and during the subsequent period of his deputation (1879–83), he elaborated the following natural families for the *Flora of British India*:—In vol. ii.: *Saxifragaceae*, *Crassulaceae*, *Droseraceae*, *Hamamelideae*, *Haloragеae*, *Combretaceae*, part of *Myrtaceae*, *Melastomaceae*, *Lythraceae*, *Onagraceae*, *Samydaceae*, *Cucurbitaceae*, *Begoniaceae*, *Datisceae*, *Cacteae*, *Ficoideae*, *Umbelliferae*, *Araliaceae* and *Cornaceae*. In vol. iii.: *Caprifoliaceae*, *Valerianeae*, *Dipsaceae*, *Stylideae*, *Goodenovieae*, *Campanulaceae*, *Vacciniaceae*, *Ericaceae*, *Monotropeae*, *Epacrideae*, *Diapensiaceae*, *Plumbagineae*, *Myrsineae*, *Sapotaceae*, *Ebenaceae*, *Styraceae*, *Oleaceae* and *Salvadoraceae*. In vol. iv.: *Loganiaceae*, *Gentianaceae*, *Polemoniaceae*, *Hydrophyllaceae*, *Borragineae*, *Convolvulaceae*, *Solanaceae*, *Lentibularieae*, *Gesneraceae*, *Bignoniaceae*, *Pedalineae*, *Acanthaceae* and *Verbenaceae*.

He also prepared, largely at Kew, monographs of the *Commelinaceae* and of the *Cyrtandreae*, published in 1881 and 1883 respectively, for De Candolle's *Suites au Prodrome*.

The group *Glumaceae*, as numerous notes on specimens in the Calcutta Herbarium show, appears to have early attracted Mr. Clarke's attention; as time went on this attention became more particularly concentrated on the *Cyperaceae*.

He was not able to give much time to the study of this family while on duty at Kew between 1879 and 1883 till towards the close of the period, when he published in the last-mentioned year, in the Linnean Society's Journal, accounts of the Madagascar species of *Cyperus* and of the genus *Hemicarex* and its allies. During the last two months of his residence in England, advantage was taken of his special knowledge in having the Indian species of the genus *Cyperus* at Kew rearranged. When Mr. Clarke left for India Sir Joseph Hooker requested him to publish the results of this work so as to assist later on in the elaboration of the genus for the *Flora of British India*. On reaching India Mr. Clarke was able to consult and similarly rearrange the rich Indian material of the genus in the Calcutta Herbarium; thereafter, he published a review of the Indian species of *Cyperus* in the *Journal of the Linnean Society* for 1884.

On retiring from India Mr. Clarke gave the greater part of his time to the further study of *Cyperaceae*, his object being to complete a general monograph of this difficult family. As the

work progressed he became by degrees the recognised authority on the subject, to whom botanists of every nationality sent their collections from all parts of the world for identification. As a consequence his monograph, which unfortunately has not yet been published, received additions up to the time of his death.

His devotion to this family even after his retirement, when, at the request of Sir J. D. Hooker and Sir W. T. Thiselton-Dyer, he elaborated accounts of it for the *Flora of British India*—published 1893–4; for the *Flora Capensis*—published 1897–8; for the *Flora of Tropical Africa*—published 1901–2; and for the *Index Florae Sinensis*—published 1903–4, was by no means exclusive; he found time to prepare accounts of the natural families *Gesneraceae*, *Acanthaceae* and *Commelynaceae*, both for the *Flora Capensis* and the *Flora of Tropical Africa*; and for the latter work accounts, not yet published, of the *Amarantaceae* and the *Chenopodiaceae*. For the *Flora of the Malayan Peninsula* he elaborated the *Gentianaceae* and the *Acanthaceae*, the latter not yet issued. He had also practically completed a continuation of Lowe's *Flora of Madeira*; he was engaged when overtaken by his fatal illness in collecting materials for an introductory memoir of the late Rev. R. T. Lowe.

His minute knowledge of the *Cyperaceae* was made the basis of an important paper on biologic regions and tabulation areas, published in the *Philosophical Transactions* in 1892, and was applied to the further discrimination of sub-subareas in the tabulation area of British India in another important paper published in the Linnean Society's Journal in 1898.

Of Mr. Clarke's attainments in other directions and of his wide knowledge of non-botanical subjects this is not the place to speak. Lucid and incisive, his correspondence was to be treasured. Courteous, unselfish and modest as he was versatile and informed, his conversation had an indescribable charm. His death leaves a blank in the Herbarium hardly to be filled; not Kew alone, but systematic botany everywhere is the poorer for this loss.

Below is given as complete a list as possible of Mr. Clarke's contributions to botanical literature :—

List of Botanical Contributions by C. B. Clarke, M.A., F.R.S.

A list of the Flowering Plants of Andover. Calcutta, 1866. 8vo. pp. 114. With map.

Commelynaceae et Cyrtandraceae bengalenses. Calcutta, 1874. fol. pp. 139 + ii., tt. 93.

Compositae indicae descriptae et secus genera Benthamii ordinatae. Calcutta, 1876. 8vo. pp. v. + xxiv. + 347 + xlv.

Roxburgh, Flora indica . . . reprinted literatim from Carey's edition of 1832. Preface by C. B. Clarke. Calcutta, 1874. 8vo.

Commelinaceae in DC. Monogr. Phan. iii. 113–324, tt. 1–8. (1881.)

Cyrtandreae in DC. Monogr. Phan. v. pars 1, 1–303, tt. 1–32. (1883.)

Hooker, J. D., Flora of British India.

ii. 388–411. Saxifragaceae (1878).
ii. 411–423. Crassulaceae (1878).
ii. 423–425. Droseraceae (1878).
ii. 425–430. Hamamelideae (1878).
ii. 430–434. Haloragеae (1878).
ii. 443–461. Combretaceae (1878).
ii. 506–512. Myrtaceae (Barringtonieae) (1879).
ii. 512–565. Melastomaceae (1879).
ii. 565–581. Lythraceae (1879).
ii. 582–590. Onagraceae (1879).
ii. 590–598. Samydaceae (1879).
ii. 604–635. Cucurbitaceae (1879).
ii. 635–656. Begoniaceae (1879).
ii. 656–657. Datisceae (1879).
ii. 657–658. Cacteae (1879).
ii. 658–665. Ficoideae (1879).
ii. 665–720. Umbelliferae (1879).
ii. 720–740. Araliaceae (1879).
ii. 740–748. Cornaceae (1879).
iii. 1–17. Caprifoliaceae (1880).
iii. 210–215. Valerianeae (1881).
iii. 215–219. Dipsaceae (1881).
iii. 419–420. Stylideae (1881).
iii. 420–421. Goodenovieae (1881).
iii. 421–442. Campanulaceae (1881).
iii. 442–455. Vacciniaceae (1881–2).
iii. 456–476. Ericaceae (1882).
iii. 476–477. Monotropeae (1882).
iii. 477. Epacrideae (1882).
iii. 478. Diapensiaceae (1882).
iii. 478–481. Plumbagineae (1882).
iii. 482–506. Primulaceae (1882).
iii. 507–534. Myrsineae (1882).
iii. 534–549. Sapotaceae (1882).
iii. 549–572. Ebenaceae (1882).
iii. 572–590. Styraceae (1882).
iii. 590–618. Oleaceae (1882).
iii. 618–620. Salvadoraceae (1882).
iv. 78–93. Loganiaceae (1883).
iv. 93–132. Gentianaceae (1883).

iv. 133. Polemoniaceae (1883).
iv. 133–134. Hydrophyllaceae (1883).
iv. 134–179. Borragineae (1883).
iv. 179–228. Convolvulaceae (1883).
iv. 228–246. Solanaceae (1883).
iv. 328–336. Lentibularieae (1884).
iv. 336–375. Gesneraceae (1884).
iv. 376–386. Bignoniaceae (1884).
iv. 386–387. Pedalineae (1884).
iv. 387–558. Acanthaceae (1884–5).
iv. 560–604. Verbenaceae (1885).
vi. 585–748. Cyperaceae (1893–4).

Thiselton-Dyer, Sir W. T., Flora of Tropical Africa.

iv. Sect. ii. 499–512. Gesneraceae, by J. G. Baker and C. B. Clarke (1906).
v. 1–262. Acanthaceae, by I. H. Burkill and C. B. Clarke (pp. 44–261 by C. B. Clarke only) (1899–1900).
viii. 25–88. Commelinaceae (1901).
viii. 266–524. Cyperaceae (1901–02).

Thiselton-Dyer, Sir W. T., Flora Capensis.

v. 1–92. Acanthaceae (1901).
vii. 7–15. Commelinaceae (1897).
vii. 149–310. Cyperaceae (1898).

Philippine Acanthaceae. Department of the Interior. Bureau of Government Laboratories. No. 35, 89–93 (1905).

Journal of Botany.

vi. 215–218. A list of Andover Plants (1868).
xix. 100–106, 135–142, 163–167. A Revision of the Indian Species of Leea (1881).
xix. 193–202. Notes on Commelinaceae (1881).
xx. 369–370. Fertilization of Ophrys apifera (1882).
xxv. 267–271. Eleocharis. Species in Europa vigentes recensuit C. B. Clarke (1887).
xxvi. 201–204. Root-Pressure (1888).
xxviii. 18–19. On Cyperus Jemenicus, *Rottb.* (1890).
xxix. 225–228. On Epilobium Duriaei, *J. Gay*, a new (?) English Plant (1891).
xxx. 155–158. Annals of the Royal Botanic Garden, Calcutta (rev.) (1892).
xxx. 321–323. On Holoschoenus, *Link* (1892).
xxxi. 135–138. Collectors' Numbers (1893).
xxxi. 182–183. Abnormal Spring (1893).
xxxi. 211–212. Reminiscences of Alphonse De Candolle (1893).

xxxii. 116–120. Vesque's "Guttiferae" (rev.) (1894).

xxxii. 345–347. Prain's "Memoirs" (rev.) (1894).

xxxiv. 224–226. New East African Cyperaceae (1896).

xxxiv. 415–417. List of British Cyperaceae (excluding Carex) (1896).

xxxv. 71–73. Distribution of Three Sedges (1897).

xxxviii. 278. Impatiens glandulifera, *Royle* (1900).

Journ. Linn. Soc.

xi. 438–454. Commelynaceae of Bengal (1870).

xiv. 8. Hydrotrophus, a new genus of Hydrocharidaceae (1873).

xiv. 410. On Hieracium silhetense, *DC.* (1875).

xiv. 423–457. On Indian Gentianaceae (1875).

xv. 113. On Edgaria (1876).

xv. 116–159. Botanic Notes from Darjeeling to Tonglo (1876).

xvii. 159. Two kinds of Dimorphism in Rubiaceae (1878).

xvii. 310. On Gardenia turgida, *Roxb.* (1879)

xvii. 402. Ferns of North India (1879).

xviii. 114–132. On Indian Begonias (1880).

xviii. 468. Right- and Left-hand Contortion (1881).

xviii. 524. Dimorphism in Arnebia and Macrotomia (1881).

xix. 206. On Orchis incarnata, *Linn.* (1882).

xix. 289. On two Himalayan Ferns (1882).

xx. 279–296. Madagascar Species of Cyperus (1883)

xx. 374–403. On Hemicarex, *Benth.*, and its allies (1883).

xxi. 1–202, tt. 1–4. On the Indian Species of Cyperus; with remarks on some others (1884).

xxi. 252–255. Notes on the Flora of Parasnath, North-western Bengal (1884).

xxi. 384–391. Botanic Notes from Darjeeling to Tonglo and Sundukphoo (1885).

xxii. 128–136. Botanical Observations made in a Journey to the Naga Hills (1886).

xxiv. 407. On Panicum supervacuum, sp. nova (1888).

xxiv. 408–418. Supplementary Note on the Ferns of Northern India, with J. G. Baker (1888).

xxv. 1–107, tt. 1–44. On the Plants of Kohima and Muneypore (1889).

xxx. 299–315. On certain authentic Cyperaceae of Linnaeus (1894).

xxxiv. 1–146, t. 1 (map). On the Subsubareas of British India, illustrated by the detailed distribution of the Cyperaceae in that Empire (1898).

xxxiv. 295–299. On Carex wahlenbergiana (1899).

xxxv. 403–405. Note on Carex Tolmiei, *Boott.*

xxxvi. 202–319. Enumeration of all the Plants known from China Proper, etc. Cyperaceae (1903–04).

xxxvii. 1–16. List of the Carices of Malaya (1904).

Proc. Linn. Soc.

(1880–82), 35. Species of Orchis exhibited.

(1894–95), 14–29. Presidential Address to the Linnean Society. On the Soondreebun of Bengal (1896).

(1895–96), 17–29. Presidential Address. Collectors' Numbers. Observations on Sedges, etc. (1896).

Trans. Linn. Soc.

ser. 2, iii. 395–398. Determined the Cyperaceae of the Malay Peninsula (1893).

ser. 2, iv. 244–246. Determined the Cyperaceae of the Flora of Mt. Kinabalu (1894).

ser. 2, iv. 498. Determined the Commelynaceae of the Matto Grosso Expedition (1895).

ser. 2, iv. 511–513. Determined the Cyperaceae of the Matto Grosso Expedition (1895).

Phil. Trans. Roy. Soc., B, 1892, pp. 371–387, tt. 24 & 25. On Biologic Regions and Tabulation Areas (1893).

Proc. Roy. Soc., lxx. 496–498. Antarctic Origin of the Tribe Schoenae (1902).

Engl. Bot. Jahrb.

xxx. Beibl. 68, 1–44. Cyperaceae (praeter Caricinas) chilenses (1901).

xxxiv. Beibl. 78, 1–6. Sodiro, Plantae ecuadorenses. Cyperaceae (1904).

xxxviii. 131–136. Engler, Beiträge zur Flora von Afrika, xxix. Cyperaceae africanae (1906).

Bot. Tidsskrift.

xxiv. 23–38. Schmidt, Flora of Koh Chang. Cyperaceae (1901).

xxiv. 139–146.—Compositae, Umbelliferae (1902).

xxiv. 192–201.—Lythraceae, Melastomaceae, Scrophulariaceae, Acanthaceae (1902).

xxvi. 323–328.—Verbenaceae, Labiatae (1904).

Bull. l'Herb. Boiss.

iv. Append. iii. 28–33, 35–36. Schinz, Die Pflanzenwelt Deutsch-Südwest-Afrikas. Cyperaceae und Commelinaceae, bestimmt von C. B. Clarke (1896).

vi. Append. i. 19–24. Chodat, Plantae Hasslerianae. Cyperaceae und Commelinaceae (1898).

vii. 892. Schinz, Beiträge zur Kenntnis der Afrikanischen Flora. xi. Cyperaceae, bestimmt von C. B. Clarke (1899); continued in Mem. l'Herb. Boiss. n. 10, 25–27 (1900), and 27–28. Commelinaceae (1900).

sér. 2, iii. 663.—Cyperaceae. Cyperus Schlechteri, *C. B. Clarke*, nov. spec. (1903).

sér. 2, iii. 938–1030. Chodat and Hassler, Plantae Hasslerianae. Cyperaceae (1903).

sér. 2, iv. 995–996. Schinz, Beiträge zur Kenntnis der Afrikanischen Flora. xvi. Cyperaceae (1904).

sér. 2, v. 712–719. Ostenfeld, A list of Plants collected in the Raheng District, Upper Siam, by Mr. E. Lindhard, [chiefly] determined by C. B. Clarke (1905).

sér. 2, vi. 709. Schinz, Beiträge zur Kenntnis der Afrikanischen Flora. xix. Cyperaceae. Mariscus pseudo-vestitus, *C. B. Clarke*, sp. nov. (1906).

Bull. Acad. Int. Géogr. Bot.

xiv. 197–203. Cyperaceae (excl. Carices) japonicae et coreanae a R. P. Urb. Faurie lectae quas determinavit C. B. Clarke et edidit H. Léveillé (1904).

xiv. 204–205. Cyperaceae (excl. Carices) a R. P. J. Cavalerie in Provincia Kouy-Tcheou apud sinenses lectae quas det. C. B. Clarke et ed. H. Léveillé (1904).

Gard. Chron. 1905, xxxviii. 162, f. 55. Schizandra Henryi, *Clarke* (1905).

H. Marshall Ward.—After a long and trying illness Prof. Marshall Ward, Sc.D., F.R.S., died on August 26th at the age of 52. During the past 11 years he occupied the Chair of Botany at Cambridge, and his death is a severe loss to the University and to botanical science.

At the beginning of his scientific career in 1874 he attended Prof. Huxley's lectures on Biology at South Kensington; the next year was spent at Owens College, and, in the following year, having gained an entrance scholarship in Natural Science at Christ's College, Cambridge, he continued his studies there, obtaining first-class honours in the Natural Science Tripos in 1879.

Having completed his preliminary scientific education, he at once devoted his energies to botanical research. He studied for a time under Prof. Sachs at Würzburg, and in 1880 published an important paper on the embryo-sac in Angiosperms. This piece of work was carried out at Kew in the Jodrell Laboratory, which had been founded a few years previously for the purpose of affording facilities for research on material supplied by Kew. This work on the embryo-sac is thus one of the early contributions to the long series of researches, which have since been carried out in this laboratory, by a succession of botanists.

In 1880 Marshall Ward was sent by the Government to Ceylon to study the cause of the coffee-leaf disease, and the results of his investigations were published in Ceylon, and in a paper in the Journal of the Linnean Society (1882) on the life-history of the fungus causing this disease. In 1882 he became Assistant Lecturer at Owens College (now the Victoria University); three

years later he was appointed Professor of Botany in the Forestry Department at Cooper's Hill, and in 1895 was elected to the Professorship at Cambridge.

The following are some of the distinctions conferred on him. He was elected a fellow of the Royal Society in 1888, and was chosen to read the Croonian Lecture in 1890, the subject being "Some relations between host and parasite in certain epidemic diseases of plants." In 1892 the University of Cambridge made him a Doctor of Science, and in the following year the Royal Society awarded him the Royal Medal for his researches into the life-history of Fungi and Schizomycetes. He was president of the botanical section of the British Association at Toronto in 1897, and president of the British Mycological Society from 1900 to 1902.

To return to the scientific work published by Prof. Marshall Ward we can only mention a few out of the large number of papers produced. Some of these deal with the life-history of fungal parasites, *e.g.*, a research on the structure and life-history of *Entyloma Ranunculi* (Phil. Trans., 1887), and "A Lily disease" (Ann. Bot. II., 1888). Others are concerned with bacteria and yeasts. Of these "The Ginger-beer plant and the organisms composing it" is a study of the biology of the dual organism, composed of a yeast and a bacterium symbiotically associated, having special interest in connection with the subject of fermentation; and a paper on symbiosis and symbiotic fermentation was published in the transactions of the Institute of Brewing (1901). A detailed work on the bacteriology of the Thames was carried out in conjunction with Prof. Percy Frankland, F.R.S., in the years 1893–6. In 1894 a paper published in the Philosophical Transactions of the Royal Society recorded a large number of experiments on the action of light on bacteria, and attracted a good deal of public attention, on account of the hygienic aspect of the subject. His later work was largely given to a study of rusts allied to that of the wheat, and very interesting and important results were made known regarding physiological races (biologic forms) of the rust which attacks various species of *Bromus*. This work was published in the Transactions of the Cambridge Philosophical Society (1902) and in other papers.

Besides the original works referred to, Prof. Ward found time to write several books, some dealing with the diseases of plants, and others connected with Forestry. The chief of these are: "Timber and some of its diseases" (1889), "The Oak; a popular introduction to Forest Botany" (1892), "Disease in plants" (1901), "Grasses" (1901), and "Trees" a large book, the publication of which is not yet complete.

All Prof. Ward's work is characterised by extremely careful observation and accuracy of description. His unceasing energy and devotion to his duties have left their mark on the Botanical Department at Cambridge, where the splendid University Laboratories, which were formally opened two years ago, form a fitting memorial to his labours.

L. A. B.

WILLIAM MITTEN, A.L.S., BRYOLOGIST.—By the death of this gentleman Kew has lost a very old correspondent and a valued collaborator. His first letter to Sir William Hooker is dated December 8th, 1846, and relates to the parasitism of *Thesium linophyllum*, in connection with a paper which appeared in Hooker's "London Journal of Botany" in 1847, and was reproduced in the "Annales des Sciences Naturelles" and other publications.

He was born at Hurstpierpoint, Sussex, on November 30th, 1819, and died in the same place, July 27th, 1906, so that he was in his eighty-seventh year. He was a pharmaceutical chemist by profession and a botanist by predilection. As quite a young man he took up the study of British plants of all classes, and being a keen and critical observer he soon discovered a number of species, especially of mosses, not previously recorded as growing in this country. Through his early discoveries he became acquainted with the late William Borrer of the adjoining parish of Henfield. This acquaintance ripened into friendship and was the means of bringing Mitten under the notice of other botanists, notably Sir William Hooker, through whose influence and support he concentrated his attention more particularly on the Musci and Hepaticae, as to which he soon became a recognised authority. For many years most of the Kew collections of these natural orders were sent to him for elaboration and they formed the basis of most of his publications. His earliest records and contributions appeared in the "Phytologist," from 1842; Hooker's "Journal of Botany," from 1847; the "Annals of Natural History," from 1851; and the "Journal of the Linnean Society," from 1859. Noteworthy amongst his early discoveries, is *Carex montana*, L., which he collected in 1843, near Eridge, Sussex, about a mile south of Tunbridge Wells. This is the first record for Britain; but the species has since been found in most of the southern Counties, from Kent to Devon and Shropshire.

In 1849 Sir William Hooker offered him the Curatorship of his herbarium, in succession to J. E. Planchon; but he had to decline for financial reasons, and the same year he acquired a chemist's business at Hurst, which he carried on, with the assistance of his daughter, Miss Flora Mitten, up to his death.

Among his earlier contributions of greater length to botanical literature are the Hepaticae to Hooker's "Flora Novae Zelandiae," in 1855, and to Hooker's "Flora Tasmaniae," in 1860. His most comprehensive work, the "Musci Austro-Americani," occupies the whole of the twelfth volume of the "Journal of the Linnean Society," and was published in 1869. It contains Latin descriptions of 1,745 species (belonging to 127 genera) including very many new ones. This represented the labour of many years, and was a remarkable achievement for an amateur having a multitude of duties to perform. Richard Spruce's collection formed the foundation of this work, which also includes collections made by Burchell, Weir, Mathews, Jameson and others in South America. It also includes the mosses of that part of Central America which lies within the tropics, of the West Indies, of the Falkland Islands, and of Juan Fernandez, which are not covered by the title.

Apart from short notes, the Catalogue of Cryptogamic Plants collected by J. Jameson in the vicinity of Quito (Hooker's Kew Journal of Botany, III. (1851) pp. 49–57 and pp. 351–361) was the beginning of a long series of articles on Musci and Hepaticae, chiefly based, as already observed, on Kew collections. Some idea of the extent and comprehensiveness of his work may be gathered from the following imperfect list :—Victoria, Australia (Mueller), 1856 ; Moulmein (Parish), 1856 ; India (all collectors), 1859 ; New Zealand and Tasmania (Archer and others), 1860 ; Fiji (Milne, Seemann), 1861–2 ; West Tropical Africa (Vogel, Barter, Mann), 1862–3 ; Atlantic Islands (Johnson), 1865 ; North America (Lyall), 1865 ; China and Japan (Oldham), 1865 ; Polynesia (Powell), 1869 ; Tropical America, &c. (all collectors), 1869 ; Ceylon (Thwaites), 1873 ; Island of St. Paul (Milne, Strange), 1875 ; Challenger Expedition (Moseley), 1877 ; Kerguelen (Eaton), 1877 ; Cape of Good Hope (Eaton), 1878 ; Rodriguez (Balfour), 1879 ; Polynesia (Milne and others), 1883 ; Australia (all collectors), 1883 ; Remote Islands of the Atlantic and Southern Oceans and the South-Eastern Moluccas (various collectors), 1884–5 ; Japan (all collectors), 1891 ; and Borneo (all collectors), 1894. The last was prepared jointly with Mr. C. H. Wright, of the Kew Herbarium.

Although Mr. Mitten accomplished so much, he was personally almost unknown in botanical circles. He very rarely visited London, and more rarely Kew. His work was all done at home and mostly between whiles at his pharmacy. Before Miss Flora Mitten became a qualified dispenser he was very much tied, and, as he explained in one of his letters to Sir W. Hooker, Sunday was the only day that he was free or partially free. Writing in 1854, he states that he had only been absent from home two week-days during five years. By those who knew him he was very highly esteemed for his gentle manners, his kind disposition, his readiness to help, his modesty in discussion, and his reverence for the truth.

Mittenia, Lindberg, a genus of mosses, comprising two Australasian species, commemorates the deceased.

Mittenia, Gottsche (Hepaticae), is the same as *Pallavicinius*, Gray.

Mitten was elected an Associate of the Linnean Society of London in 1847, and he was an honorary member of several Colonial and local Scientific Societies.

W. B. H.

Mesembryanthemums.—No better proof of the decline of what has been termed the collector-spirit in horticulture during the last half century can be found than in the position now occupied by such genera as *Erica*, *Aloe*, *Agave*, *Pelargonium*, and *Mesembryanthemum*. Even Orchids show the same change, collector-cultivators priding themselves more on the commercial value of rare or peculiarly marked varieties and hybrids of garden origin than on the extent and richness in species of their collections. The beautiful Cape heaths grown in English collections half a century and more ago, and figured in Andrew's *Heathery* have

nearly all gone out of cultivation, not, as is popularly believed, because of difficulties experienced in their cultivation, but because horticultural taste or fashion has changed. And this is true of other genera which during the period named had many admirers among English horticulturists. Twenty-three years ago Sir Joseph Hooker wrote :—"There are many good reasons for encouraging the cultivation of the *once* favourite genus *Mesembryanthemum*, amongst which not the least is their duration, for when once established they need never be lost ; they are, further, evergreen, cost little in soil or cleaning, and many of them are amongst the most brilliantly coloured greenhouse plants." There has always been a good collection of the species at Kew, where they are grown in the house devoted to certain South African plants, except during the summer, when they are placed outside. They fail, however, to arouse the interest of horticulturists, although at certain seasons the display of their many-coloured, daisy-like flowers is bright and pleasing. Many of the species are remarkable for quaintness of structure in leaf, and there are few more striking plants than such species as *M. truncatellum*, *M. Bolusii*, *M. tigrinum*, *M. calamiforme*, and *M. testiculare*.

In the hope that the attention of cultivators may be restored to them a list is given here of the Mesembryanthemums now in cultivation at Kew. It comprises over 100 species, and although only about one-third of the number known to botanists these are representative of the characteristics of the genus. The following particulars, showing the position Mesembryanthemums have held in horticulture from the earliest times, accompanied the plate of *M. calamiforme* in the *Botanical Magazine*, t. 7775 (1901). "The genus *Mesembryanthemum* holds an important place in the history of horticulture. Dillenius, who treats of the species known to him at great length, gives an interesting account of the successive introduction of those known to his predecessors. Of these, he says, 15 were known to Bobart (1648) ; 20 to Breyn (1680) ; 39 to Ray (1686) ; 23 to Herman (1687) ; 21 to Plukenet (1696) ; 30 to Bradley (1716) ; 36 to Tournefort. Dillenius himself describes and figures 47 species, all cultivated in Sherard's Garden at Eltham in 1732. Following Dillenius, Linnaeus in the *Hortus Cliffortianus* (1737) gives 30 species ; and in the *Species Plantarum* (1753) 35, where he reduces some of Dillenius' species to varieties. Coming down to later times, Aiton's *Hortus Kewensis* (1789) contains 70 species, and the 2nd edition (1811) no less than 175." This appears to have been the high-water mark of the genus, so far as Kew is concerned. In 1899 there were 113 species in cultivation at Kew, the number at the present time being 108. There are 25 species figured in the *Botanical Magazine*.

MESEMBRYANTHEMUM, L. FICOIDEAE.

M. abbreviatum, *Haw.*	Salm-Dyck, Mes. §19, t. 5	Australia.
M. acinaciforme, *L.*	Salm-Dyck, Mes. §19, t. 6	South Africa.
M. adscendens, *Haw.*	Salm-Dyck, Mes. §8, t. 4	„
M. aequilaterale, *Haw.*	Salm-Dyck, Mes. §19, t. 1.	Australia and South America.

M. amoenum, *Salm-Dyck*, Mes. §27, t. 2 ...	South Africa.
M. angustum, *Haw.*	„
M. aurantiacum, *Haw.* Salm-Dyck, Mes. §25, t. 2	„
M. aureum, *L.* Bot. Mag., t. 262	„
M. australe, *Sol.* Salm-Dyck, Mes. §18, t. 2	Australia and New Zealand.
M. barbatum, *L.* Bot. Mag., t. 70	South Africa.
M. bigibberatum, *Haw.* Salm-Dyck, Mes. §7, t. 4	„
M. blandum, *Haw.* Bot. Reg., t. 582... ...	„
M. Bolusii, *Hook.* Bot. Mag., t. 6664... ...	„
M. Brownii, *Hook.* Bot. Mag., t. 6985 ...	„
M. bulbosum, *Haw.* Salm-Dyck, Mes. §52, t. 3	„
M. caespitosum, *N.E.Br.*	„
M. calycinum, *Haw.* Salm-Dyck, Mes. §51, t. 3	„
M. candens, *Haw.* Salm-Dyck, Mes. §51, t. 4	„
M. caulescens, *Mill.* Salm-Dyck, Mes. §30, t. 1	„
M. coccineum, *Haw.* Lodd. Bot. Cab., t. 1033	„
M. confertum, Hort.=curvifolium, var. flexifolium, *N.E.Br.*	„
M. congestum, *Salm-Dyck*, Mes. §23, t. 2 ...	„
M. Cooperi, *Hook. f.* Bot. Mag., t. 6312 ...	„
M. cordifolium, *L.* Salm-Dyck, Mes. §61, t. 1	„
M. corniculatum, *L.* Salm-Dyck, Mes. §15, t. 6	„
M. crassulinum, *DC.* Salm-Dyck, Mes. §56, t. 3	„
M. cruciatum, *Haw.* Salm-Dyck, Mes. §7, t. 7	„
M. crystallinum, *L.*	„ and South Europe.
M. cultratum, *Salm-Dyck*, Mes. §8, t. 5 ...	South Africa.
M. curviflorum, Haw.=blandum.	
M. curvifolium, *Haw.* Salm-Dyck, Mes. §47, t. 2	„
M. „ var. album, *Hort.*	„
M. „ var. flexifolium, *N.E.Br.* ...	„
M. deltoides, *L.* Salm-Dyck, Mes. §30, t. 2 ...	„
M. depressum, *Haw.* Salm-Dyck, Mes. §8, t. 7	„
M. difforme, *Haw.* Salm-Dyck, Mes. §7, t. 3	„
M. digitiforme, *Haw.*	„
M. diminutum, *Haw.*	„
M. dolabriforme, *L.* Salm-Dyck, Mes. §6, t. 3	„
M. echinatum, *Ait.* Salm-Dyck, Mes. §53, t. 2	„
M. Ecklonis, *Salm-Dyck*, Mes. §49, t. 5 ...	„
M. edule, *L.*	„
M. elegans, *Jacq.*...	„

M. falcatum, *L.* Salm-Dyck, Mes. §29, t. 2 ... South Africa.
M. falciforme, *Haw.* Salm-Dyck, Mes. §29, t. 1 „
M. flexifolium, Haw. *See* M. curvifolium.
M. formosum, *Haw.* Lodd. Bot. Cab. t. 1293 South Africa.
M. geminiflorum, *Haw.* Salm-Dyck, Mes. §17, t. 4 ... ... „
M. glaucum, *L.* Salm-Dyck, Mes. §25, t. 1 ... „
M. heteropetalum, *Haw.* Salm-Dyck, Mes. §21, t. 2 ... ... „
M. hispidum, *L.* Salm-Dyck, Mes. §51, t. 6... „
M. inclaudens, *Haw.* Bot. Mag. t. 1663 ... „
M. intonsum, *Haw.* Salm-Dyck, Mes. §52, t. 2 „
M. lacerum, *Haw.* Lodd. Bot. Cab. t. 1279 ... „
M. laeve, *Thunb.* ... ... „
M. Lehmanni, *E. & Z.* Salm-Dyck, Mes. §42, t. 1 ... ... „
M. Lepidum, *Haw* ... ... „
M. lineolatum, *Haw?* Salm-Dyck, Mes. §33, t. 7 „
M. linguiforme, *L.* Lodd. Bot. Cab., t. 1307 „
M. longispinulum, *Haw.* Salm-Dyck, Mes. §54, t. 4 ... ... „
M. longum, *Haw.* ... ... „
M. lupinum, *Haw.* Salm-Dyck, Mes. §5, t. 3 „
M. macrorhizum, *Haw.* Salm-Dyck, Mes. §49, t. 3 ... ... „
M. Mahoni, *N.E.Br.* ... ... Rhodesia.
M. maximum, *Haw.* Bot. Reg. t. 358 ... South Africa
M. minutum, *Haw.* Bot. Mag., t. 1376 ... „
M. multiceps, *Salm-Dyck?* Salm-Dyck, Mes. §6, t. 2 ... ... „
M. multiflorum, *Haw.* Salm-Dyck, Mes. §37, t. 1 ... ... „
M. multiradiatum, *Jacq.* ... ... „
M. muricatum, *Haw.* Salm-Dyck, Mes. §30, t. 3 „
M. mutabile, *Haw.* Salm-Dyck, Mes. §21, t. 3 „
M. noctiflorum, *L.* Lodd. Bot. Cab., t. 495 ... „
M. „ var. fulvum. *Salm-Dyck*, Mes. §43, t. 2 ... ... „
M. nuciforme, *Haw* ... ... „
M. obconellum, *Haw.* Salm-Dyck, Mes. §1, t. 3 „
M. perfoliatum, *Haw.* Salm-Dyck, Mes. §33, t. 1 ... ... „
M. polyanthon, *Haw.* Lodd. Bot. Cab. t. 1281 „
„ var. elegans, *Hort.* ... ... „

M. pomeridianum, *L.* Bot. Mag., t. 540 ... South Africa.
M. productum, *Haw.* Salm-Dyck, Mes. §40, t. 4 „
M. pulchellum, *Haw.* Salm-Dyck, Mes. §34, t. 1 „
M. pustulatum, *Haw.* Salm-Dyck, Mes. §8, t. 10 ... ... „
M. pyropeum, *Haw.* Salm-Dyck, Mes. §59, t. 1 „
M. quadrifidum, *Haw.* ... ... „
M. racemosum, *N.E.Br.* ... ... „
M. rhomboideum, *Salm-Dyck*, Mes. §6, t. 5 ... „
M. rigidicaule, *Haw.* Salm-Dyck, Mes. §17, t. 2 „
M. rigidum, *Haw.* Salm-Dyck, Mes. §36, t. 2 „
M. roseum, Willd., Salm-Dyck, Mes. §29, t. 4 = multiradiatum ... ... „
M. rubricaule, *Haw.* Salm-Dyck, Mes. §20, t. 3. „
M. Salmii, *Haw.* Salm-Dyck, Mes. §7, t. 8. ... „
M. sarmentosum, *Haw.* Salm-Dyck, Mes. §17, t. 3 ... ... „
M. serrulatum, *Haw.* Salm-Dyck, Mes. §20, t. 2 „
M. spectabile, *Haw.* Bot. Mag., t. 396 ... „
M. spiniforme, *Haw.* Salm-Dyck, Mes. §47, t. 1 „
M. spinosum, *L.* Salm-Dyck, Mes. §41, t. 1 ... „
M. stelligerum, *Haw?* Salm-Dyck, Mes. §52, t. 4 „
M. subincanum, *Haw.* Salm-Dyck, Mes. §49, t. 4 ... ... „
M. sulcatum, *Hort.* Salm-Dyck, Mes. §44, t. 1 „
M. tenellum, *Haw.* Salm-Dyck, Mes. §36, t. 1 „
M. tenuifolium, *L.* Salm-Dyck, Mes. §46, t. 6 „
M. testiculare, *Ait.* Bot. Mag., t. 1573 ... „
M. tigrinum, *Haw.* Bot. Reg., t. 260... ... „
M. tricolor, *Willd.* ... ... „
M. „ var. album. ... ... „
M. truncatum, *Thunb?* ... . „
M. tuberosum, *L.* Salm-Dyck, Mes. §49, t. 2 „
M. tumidulum, *Haw.* Salm-Dyck Mes. §37, t. 3 „
M. turbinatum, *Jacq.* ... ... „
M. uncatum, *Salm-Dyck*, Mes. §8, t. 6 ... „
M. uncinatum, *Linn.* Salm-Dyck, Mes. §33, t. 3 „
M. veruculatum, *L.* Salm-Dyck, Mes. §39, t. 1 „
M. violaceum, *DC.* Salm-Dyck, Mes. §48, t. 3 „
M. virescens, *Haw.* Salm-Dyck, Mes. §19, t. 3 Australia.
M. vulpinum, *Haw.* ... ... South Africa
M. Zeyheri, *Salm-Dyck*, Mes. §40, t. 5 ... „

Presentations to Museums.—CRINELLINO STUFFING (*Posidonia Caulinii*, Koenig), *Naiadaceae.* In the Diplomatic and Consular Report on the Trade of Sicily for the year 1905, H.M. Vice-Consul at Catania reports that a factory employing 50 hands has been established at Crinellino to prepare bed-stuffing from this plant, the daily production being 5 tons. Another factory preparing the product also exists at Messina. In response to an application made through the Foreign Office, H.M. Consul at Palermo has obtained examples of the crude and prepared products for the Museum. These will be found in Room 7, Museum No. II.

MAIZE PRODUCTS (*Zea Mays*, L.), *Gramineae.* Dr. C. F. Millspaugh, Curator of the Department of Botany, Field Museum of Natural History, Chicago, has presented to the Museum a series of specimens illustrating the manufacture of Starch and Glucose from Maize. These have been placed in Room 8, Museum No. II.

VEGETABLE IVORY (*Sagus* [*Metroxylon*] *amicarum*, Wendl.), *Palmae.* Specimens of the ivory-like nuts of this palm, a native of the Pacific Islands, have been submitted by a correspondent for determination. They were purchased under the name of "Fossilized Apples" for the manufacture of ornamental articles. These nuts are exported from the Solomon Islands as Vegetable Ivory, and are known under this name and also under that of "Apple Nuts" in the commerce of this country. See *Kew Bulletin*, 1897, p. 417, and Case 51, Museum No. II.

BERG BASS (*Osyris abyssinica*, Hochst.), *Santalaceae.* Dried specimens of the leaves of this plant, described as a shrub and employed in tanning in various parts of South Africa, have recently been received at the Museum for determination. Hitherto this plant does not appear to have been considered of economic value, but an allied plant, viz., Cape Sumach (*Colpoon compressum*, Berg.), the leaves of which bear a close resemblance of those of this *Osyris*, are known to be employed locally for tanning. An article on Cape Sumach, giving analytical details, appeared in the *Kew Bulletin* for 1898, p. 18. See also Case 102, Museum No. I.

J. M. H.

Additions to the Herbarium during 1905.—Donations of specimen were made by about one hundred persons and institutions, and amounted to over 16,000 sheets. The specimens purchased amounted to nearly 7,000 sheets. The principal collections are enumerated below.

VARIOUS PARTS OF THE WORLD. *Presented:*—Orchidaceae and Asclepiadaceae from New Caledonia, South Africa and New Guinea, by Mr. R. Schlechter; Mosses and Erysiphaceae, by Mr. E. S. Salmon; Oidia, by Mr. P. Magnus.

Purchased:—Kneucker, "Gramineae Exsiccatae," lief. xvii.–xviii.; "Carices Exsiccatae," lief. xii.–xii*a*.

ARCTIC AND ANTARCTIC REGIONS. *Presented:*—Antarctic mosses, by Mr. J. Cardot; Melville Island, by Miss Louisa Dacres.

EUROPE. *Presented:*—"Kryptogamae Exsiccatae," Cent. x.–xi., by the Imperial Natural History Museum, Vienna; "Hieraciotheca gallica et hispanica," fasc. xv.–xvi., by M. G. Gautier; British Algae, by Mr. A. D. Cotton; rare British plants, by Mr. C. E. Salmon.

Purchased:—Holmes, "Algae Britannicae," fasc. xi.; Rabenhorst, "Fungi Europaei," ser. II., Cent. xlv.; Briosi and Cavara, "I Funghi Parasitti," fasc. xvi.; Degen, "Gramina Hungarica," fasc. iv.–vi.; Enander, "Salices Scandinaviae Exsiccatae," fasc. i.; Dahlstedt, Scandinavian Hieracia, Cent. xvii.; Linton, British Hieracia, supplementary fasc.; Fiori, Béguinot and Pampanini, "Flora Italica Exsiccata," Cent. i.–ii.

ORIENT AND ATLANTIC ISLANDS. *Presented:*—Canary Islands, by Mr. T. J. Dinn.

Purchased:—Bornmüller, "Iter Persicum alterum, 1902," continuation.

EASTERN AND CENTRAL ASIA. *Presented:*—Eastern Asia, by the Natural History Museum, Paris; Tibet and Chumbi, by the Botanic Gardens, Calcutta; Lhasa, by Lt.-Col. L. A. Waddell, C.I.E.; Wilson, Szechuan, by Messrs. J. Veitch & Sons; Western Szechuan, by Consul-General A. Hosie; Manberg, Yunnan, by Mr. A. K. Bulley; Hong Kong, by Mr. S. T. Dunn; Faurie, Formosan mosses, by Mr. J. Cardot.

Purchased:—Takeda, Japan, Cent. iii.–iv.

INDIA. *Presented:*—Nepenthes, by the Botanic Gardens, Calcutta; Burkill, Burmese freshwater algae, by the Botanic Gardens, Calcutta; Fungi, by Dr. E. J. Butler; British Bhutan Mosses, by Mr. J. S. Gamble, C.I.E.; Gollan, North-West Indian Mosses and Hepaticae, by Mr. J. R. Drummond; West Himalayan mosses, by Mr. J. F. Duthie; Monochlamydeae and Monocotyledons, by Sir D. Brandis, K.C.I.E.; rare Bombay plants, by Dr. T. Cooke, C.I.E.; Travancore, by Mr. T. F. Bourdillon.

MALAY PENINSULA AND ARCHIPELAGO. *Presented:*—By the Botanic Gardens, Singapore; Micholitz, Annam and Sumatra orchids, by Messrs. Sander & Sons; Copeland, Mindanao, by the Bureau of Science, Manila; Philippine Cyperaceae and Acanthaceae, by the Bureau of Science, Manila; "Plantae Bogorienses Exsiccatae," fasc. i., by the Botanic Gardens, Buitenzorg; New Guinea, by Mr. C. G. Seligmann.

Purchased:—Dr. C. C. Hosseus, Siam.

AUSTRALASIA. *Presented:*—New South Wales, by Mr. R. T. Baker; a complete series of his new species of Eucalyptus, by Mr. R. T. Baker; New South Wales Mosses, by Rev. W. W. Watts; Fiji and New South Wales Ferns, by Mr. H. N. Joynt; New Zealand and Rarotonga Hepaticae, by Mr. T. W. N. Beckett; New Zealand Ferns, by Miss L. M. Coombe.

TROPICAL AFRICA. *Presented:*—Liberia, by the Botanic Garden, Berlin; do., by Mr. H. Reynolds; Gold Coast, by Mr. W. H. Johnson; Lagos, by Mr. E. W. Foster; Cross River Division, Southern Nigeria, by Mr. N. C. McLeod; Gossweiler, Angola, by the University of Coimbra, through Dr. J. A. Henriques;

Bahr-el-Ghazal, by Mr. Harold Brown; Sudan, by Mr. A. F. Broun; Drake-Brockman, Somaliland Grasses, by the Colonial Office; Dawe and E. Brown, Uganda, by Mr. M. T. Dawe; Bagshawe, Uganda, by Lieut.-Col. C. Delmé-Radcliffe; Uganda, and Aberdare Mountains, British East Africa, by Sir H. E. M. James, K.C.I.E., C.S.I.; British East Africa, by Mr. C. F. Elliott; do., by Mr. Andrew Linton; Usagara Ferns and Mosses, by the Rev. A. North-Wood; British Central Africa, by Mr. K. J. Cameron; Allen, Victoria Falls, by Sir C. Metcalfe, Bart.; do., by Mr. C. E. F. Allen; Gardner, Buluwayo, by Mr. M. Barthelemy; Ascension Island Cryptogams, by Mr. R. N. R. Brown.

Purchased:—Zenker, Cameroons.

MASCARENE ISLANDS. *Presented*:—Seychelles, by Mr. H. P. Thomasset; Madagascar, by the Rev. R. Baron.

SOUTH AFRICA. *Presented*:—By Dr. H. Bolus; R. Schlechter, South Africa, by Dr. H. Schinz; Port Elizabeth, by Miss Ethel West; Drakensberg, by Mr. E. E. Galpin; Orange River Colony, by Mr. H. J. Sankey; Transvaal, by Mr. J. Burtt-Davy; Miss A. Pegler, Transkei Asclepiadaceae, by Prof. P. MacOwan; Stapelieae, by Mr. S. N. Pillans.

Purchased:—R. Schlechter, South Africa; Wilms, Cryptogams.

NORTH AMERICA. *Presented*:—Chidley Peninsula, Labrador, by Sir W. MacGregor, K.C.M.G., C.B.; Canada, by the Geological Survey of Canada; Northern and North-Western Montana, by the New York Botanic Garden; various North American collections, including a set of Glatfelter's Salices, by the United States National Museum; Florida, by Mr. Oakes Ames; do., by the New York Botanic Garden; Grasses, by the United States Department of Agriculture; Sarracenias of the Southern United States, by Dr. J. M. Macfarlane.

Purchased:—Collins, Eastern Quebec; Heller, California; C. F. Baker, West Coast, North America.

CENTRAL AMERICA. *Presented*:—British Honduras, by Mr. E. J. F. Campbell; Mexico, by Mr. C. G. Pringle.

Purchased:—Palmer, Mexico; Pringle, Mexico.

WEST INDIES. *Presented*:—Bahamas, by the New York Botanic Garden; Windward Coast of Dominica, by Miss E. M. Bryant.

Purchased:—Curtiss, Cuba.

TROPICAL SOUTH AMERICA. *Presented*:—British Guiana, by the Botanic Garden, Georgetown; Brazilian Ferns, by Dr. C. Lindman.

Purchased:—Ule, Amazons; Hassler, Paraguay; Fiebrig, Paraguay.

TEMPERATE SOUTH AMERICA. *Presented*:—Chubut Territory, Argentine Republic, by Mr. C. Thursby; Buchtien, Chili, by the late Mr. C. B. Clarke.

The largest contribution received was the first set of E. H. Wilson's Szechuan plants, collected during his second journey in China for Messrs. James Veitch & Sons, by whom the set was

presented. The collection comprised about 2,500 numbers, and included a special series of plants from Mount Omi. Descriptions of over thirty of the more obvious novelties contained in Wilson's two collections have already appeared (*Kew Bull.*, 1906, pp. 147–163).

A valuable set of about 1,200 plants from Chumbi and Tibet was presented by the Royal Botanic Garden, Calcutta. Many of the specimens were obtained in Chumbi and Phari by Lepcha collectors working under the supervision of Sir George King, late Superintendent of the Calcutta Garden. One of these collectors, named Dungboo, was able to penetrate as far as Lhasa and to bring back a small but interesting collection made *en route* to that city. Another very interesting collection, though of small extent and composed of rather fragmentary specimens, was made at the instigation of Sir Alfred Croft, late Director of Public Instruction, Bengal, by the Lama Ujyen Gyatsko, who went by way of Chumbi and Phari to Shigatze, returning to British Sikkim by way of Nepal. The rest of the collection was obtained during the course of the negotiations of the recent Tibet Mission. While this mission was at Khambajong in 1903, Sir F. E. Younghusband supervised native collectors belonging to the Calcutta Garden in Khamba and the Lonok. In September, 1903, the Director of the Botanical Survey of India was himself able, at the invitation of Sir F. Younghusband, to visit the mission at Khambajong in Southern Tibet. Though it was then almost too late in the season for more than the collection of seeds, the Director was able, with Sir F. Younghusband's assistance, to make satisfactory arrangements for the collection of specimens during 1904 by means of native collectors who worked immediately under Captain Walton, I.M.S., Surgeon to the Mission Staff. Much help was also given to these collectors by Mr. E. H. Walsh, I.C.S., Political Officer in Chumbi, Mr. C. White, C.I.E., Political Agent in Sikkim, and Major C. H. D. Ryder, R.E., D.S.O., the Survey Officer attached to the mission.

An unusually large number of Tropical and South African collections was presented during the year, the most noteworthy being Gossweiler's Angola and Dawe's and Brown's Uganda collections. A set of Gossweiler's Angola collection, numbering about 1,200 sheets, was presented by the University of Coimbra, through Professor J. A. Henriques. Mr. Gossweiler collected in the districts of Loanda, Malange and Cazengo, and his collection, apart from the novelties it contains, will be of great value in supplementing the Kew material of many Welwitschian species.

The Uganda collections formed and presented by Messrs. M. T. Dawe and E. Brown comprised about 1,150 sheets. A complete list of Dawe's plants is contained in his "Report on a Botanical Mission through the Forest Districts of Buddu and the Western and Nile Provinces of the Uganda Protectorate," issued as a Parliamentary Paper in April, 1906. His collections contained about 50 new species and one new genus, of which descriptions will appear in a forthcoming number of the Journal of the Linnean Society (Botany). Brown's collections are mainly from the neighbourhood of Entebbe, and show that the flora of that district is by no means yet completely known.

About 1,100 sheets of Hassler's Paraguay plants were acquired by purchase. They consist of Dr. Hassler's collections for the years 1903–5, and include a set collected by T. Rojas in the Northern Chaco of Paraguay, a little-known district.

Another large American collection was the concluding instalments of his Amazons plants, purchased from Dr. E. Ule. It included over 1,000 sheets, of which 400 were Cellular Cryptogams, and the remainder Phanerogams and Vascular Cryptogams.

A valuable contribution received from Mr. R. T. Baker, Curator of the Technological Museum, Sydney, was a complete set of the new species of Eucalyptus, described by him and investigated in Baker and Smith, "A Research on the Eucalypts, especially in regard to their Essential Oils" (Sydney, 1902).

The first fascicle of his "Salices Scandinaviae" was purchased from Mr. S. J. Enander. It contains 150 specimens and photographs, belonging to 50 species, varieties and forms, a very large proportion of which are hybrids. The beautiful photographic reproductions of unique or rare specimens form a noteworthy feature of the series.

Discovery of Goodyera repens in Norfolk.—The Rev. Guy Halliday, of Bowhill, Bradninch, Devon, recently sent to Kew a specimen of an orchid which he had collected near Holt, in North Norfolk, requesting its name. It proved to be *Goodyera repens*, and, in response to our request, he communicated the following particulars. Cycling to Holt, and botanizing by the way, he and his wife came to a pond with a pine-wood and heather adjoining. They strayed some hundred yards into the wood and had turned to go back when Mr. Halliday's eye fell upon an orchid. This was carelessly pulled up under the impression that it was *Spiranthes autumnalis*, and a hasty search was made for more, but unsuccessfully. Subsequent examination convinced him that it was not a *Spiranthes*; he thought it must be *Goodyera*, and to make sure he sent it to Kew.

Until 1885 there was no convincing record of an English station for this plant, but in Baker's *Flora of the Lake District* it is recorded, on the authority of Dr. F. A. Lees, from a fir plantation between Penrith and Carlisle. In 1888, Mr. J. J. Marshall (*Journ. Bot.*, p. 379) recorded the discovery of several plants in Houghton Wood, near Market Weighton, S.E. Yorkshire. Now comes this one from Holt. The question arises, how did the *Goodyera* reach these modern pine-woods? This suggests another question, were the young pines brought from the forests of Scotland and seeds or roots of the *Goodyera* with them? Possibly seed may have been conveyed by birds, or intentionally sown by man. Whatever the history may be, it is almost certain that the *Goodyera* did not exist in these southern localities before the pines were planted. A similar isolated locality for this plant was pointed out to Mr. Bean by Mr. Maurice de Vilmorin, at Les Barres. This is also in a young pine-wood.

Goodyera repens is one of the most widely distributed of orchids, occurring all round the northern hemisphere. The specimen from Norfolk has been deposited in the Kew Herbarium on indefinite loan.

W. B. H.

Presentations to the Library during 1905.—The Bentham Trustees have presented the following :—*Bartholomaeus Anglicus, De proprietatibus rerum*, 1535, which, excepting *The Great Herbal* of 1526, is the earliest book in the English language at Kew ; *Dioscorides, Codex Aniciae Julianae picturis illustratus*, 1905, a reproduction in facsimile of the famous Dioscoridian Codex preserved in the Imperial Library at Vienna (see *Kew Bull.*, 1905, p. 70) ; *Hill, Decade di alberi curiosi ed eleganti piante delle Indie orientali*, etc., 1786 ; *Parkinson, Paradisi in sole*, the first edition, 1629 ; *Thomé, Flora von Deutschland*, etc., 1886–89, 4 vols. ; *Urzedow, Herbarz polski*, 1595, a herbal printed in Polish and published at Cracow ; *Vallet, Le jardin du roy très chrestien Henry IV. roy de France et de Navare*, 1608 ; *Herbert, Some years travels into divers parts of Africa and Asia the Great*, ed. 3, 1677 ; *Heuglin, Reise in das Gebiet des Weissen Nil . . . in den Jahren 1862–64*, 1869 ; *Lenz, Timbuktu*, 1892, 2 vols. ; *Schlagintweit-Sakuenluenski, Reisen in Indien und Hochasien . . . in den Jahren 1854–58*, 1869–80, 4 vols. ; *Sievers, Asien*, 1893 ; also the continuation of about 20 periodicals. Sir W. T. Thiselton-Dyer, K.C.M.G., presented a large number of selected tracts from his own library, and the following :—*Berge, Pflanzenphysiognomie*, 1880 ; *Bettany, First lessons in practical Botany*, 1881 ; *Massee, European Fungus Flora, Agaricaceae*, 1902 ; *The life and letters of G. J. Romanes*, 1896 ; and *W. G. Smith, Diseases of field and garden crops, chiefly such as are caused by Fungi*, 1884. The President of the Carnegie Institute of Washington presented a copy of Conard's fine work on the genus *Nymphaea*, 1905, and *Macdougal*, etc., *Mutants and hybrids of the Oenotheras*, 1905. *Ashe, Some new species of the genus Crataegus*, etc., 1900, and *North American Flora*, vol. xxii., parts 1 and 2, 1905, were received from the Director-in-Chief of the New York Botanical Garden ; *Berger, Florula mortolensis*, 1905, from Sir Thomas Hanbury, K.C.V.O. ; a long series of articles on Vegetable Pathology and Mycology by Berkeley, published in the *Gardeners' Chronicle*, from Mr. J. B. Carruthers ; *De Wildeman, Mission E. Laurent, énumération des plantes récoltées . . . pendant sa dernière mission au Congo*, fasc. 1 and 2, 1905, from the Secrétaire Général du Département des Finances de l'État Indépendant du Congo ; *Fries, Zur Kenntnis der alpinen Flora im nordlichen Argentinien*, 1905, and *Haglund, Ur de högnordiska vedväxternas ekologi*, 1905, from the Director of the Botanic Garden, Upsala ; *Freeman, Minnesota Plant Diseases*, 1905, from the Regents of the University of Minneapolis and the author ; *Hare, Caspari, Rusby*, etc., *The National Standard Dispensatory*, 1905, from Messrs. Lea Bros. & Co. ; *MacMahon, The merchantable Timbers of Queensland*, 1905, from the Secretary, Department of Agriculture and Stock, Brisbane ; *Webbia, raccolta di scritti botanici . . . edita da U. Martelli*, 1905, from the editor ; *Massee and Crossland, The Fungus Flora of Yorkshire*, from Mr. Geo. Massee ; *Merrill,*

A review of the identifications of the species described in Blanco's Flora de Filipinas, 1905, and other publications of the Bureau of Government Laboratories of the Philippine Islands, from the Superintendent of Government Laboratories; *Monteverde, A guide to the museum of the Imperial Botanic Garden, St. Petersburg*, 1902, from Mr. V. J. Lipsky; *Naegeli and Thellung, Die Flora des Kantons Zürich*, Teil 1, 1905, from Dr. Hans Schinz, who has also presented his *Plantae menyharthianae*, 1905, and the *Flora der Schweiz*, zweite Auflage, Teil 1, 1905, by himself and R. Keller; *Oudemans, Catalogue raisonné des Champignons des Pays-Bas*, 1905, from the Academy of Sciences, Amsterdam; *Ritsema and Sack, Index phytochemicus*, 1905, from Dr. M. Greshoff; *Roessig, Die Rosen nach der Natur gezeichnet und colorirt*, [1802–20], a rare work, from Mr. W. E. Gumbleton; *J. J. Smith, Die Orchideen von Java*, from the Director of the Department of Agriculture, Buitenzorg; *Yonge, An English-Greek Lexicon*, ed. 4, 1861, from Mr. C. B. Clarke; *Hosie, Report on the province of Ssuch'uan*, 1904, and *Report on a journey to the eastern frontier of Thibet*, 1905, from the Controller of H.M. Stationery Office; *Kidder and Fletcher, Brazil and the Brazilians*, 1857, from Mr. Geo. Nicholson; *Bollettino della Arboricoltura italiana*, anno 1, 1905, from Dr. L. Savastano; *Memoirs of the [Royal] Caledonian Horticultural Society*, vol. iv., part 1, 1827, and new series, vol. i., part 1, 1905, from the Secretary, Mr. P. Murray Thomson; *Pammel, Ball and Lamson-Scribner, The Grasses of Iowa*, part 2, 1904, from Prof. L. H. Pammel; *Journal of the Federated Malay States Museums*, vol. i., Nos. 1 and 2, 1905, from the Curator of the Perak State Museum; *Collected Papers of the Lister Institute of Preventive Medicine*, No. 1, 1904, from the Secretary; *Annual Reports of the Michigan Academy of Science*, from the Librarian; *Bulletins of the Divisions of Biology and Horticulture, New Zealand Department of Agriculture*, from Mr. T. W. Kirk; *Report of the Transvaal Department of Agriculture*, 1903–04, from the Director of Agriculture; *Moniteur du Jardin botanique de Tiflis*, livraison 1, 1905, from the Director; *Smithsonian Miscellaneous Collections*, vols. xlvi. and xlvii., 1904–05, from the Secretary of the Smithsonion Institution. The following have been presented by their respective authors:—*F. M. Bailey, The Queensland Flora, General Index*, 1905; *H. Bolus, Sketch of the floral regions of South Africa*, 1905; *A. Chevalier, Les végétaux utiles de l'Afrique tropicale française*, vol. i., fasc. 1, 1905; *E. De Wildeman, Notices sur des plantes utiles ou intéressantes de la Flore du Congo*, fasc. 2 and 3, 1904–05; *L. Diels, Beiträge zur Flora des Tsin ling shan*, etc., 1905; *L. Diels and E. Pritzel, Fragmenta phytographiae Australiae occidentalis*, 1905; *W. G. Farlow, Bibliographical index of North American Fungi*, vol. i., part 1, 1905; *E. C. Jeffrey, The comparative anatomy and phylogeny of the Coniferales*, part 2, 1905; *E. C. Jellett, Germantown old and new*, 1904; *V. J. Lipsky, Flora Asiae mediae*, 1–3, 1902–05, and other works; *J. P. Lotsy, Vorlesungen über Deszendenztheorien*, etc., Erster Teil, 1905; *J. Matsumura, Index plantarum japonicarum*, vols. i., and ii., pars. 1, 1904–05; *C. H. Peck, Mushrooms and their use*, 1897; *E. A. Petherick, Catalogue of the York Gate Library formed by Mr. S. W. Silver*, ed. 2, 1866 (received through the kind offices of Mr. O. Omash); *W. L. Rutton, The*

Royal Residences at Kew, 1905 (from the *Home Counties Magazine*); *C. S. Sargent, Manual of the Trees of North America*, 1905; *T. R. Sim, Tree-planting in Naial*, 1905; *J. W. H. Trail, The Flora of Buchan*, 1904; *A. H. Unwin, Future Forest Trees*, 1905; *M. L. de Vilmorin and D. Bois, Fruticetum Vilmorinianum*, 1904; *F. N. Williams, Liste des Plantes connues du Siam*, 1904–05; *H. Wright, Hevea brasiliensis or Pará Rubber*, 1905; *A. Negreiros, Le Mozambique*, 1904. The continuation of several periodicals have been presented, as in former years, by Sir J. D. Hooker, G.C.S.I. The manuscripts presented include the *Journal of Sir J. Banks on Captain Cook's first voyage round the world*, 3 vols., from Mr. R. H. Hooker; this is a transcript of the copy made of the original MSS. for Mr. Dawson Turner; *Notes on fruit-trees, Correspondence*, and *Observations and remarks on the diseases of fruit- and forest-trees*, altogether 5 volumes, by W. Forsyth, from Mrs. Cochran; *E. Madden's Itineraries, Notes on Plants*, and *Miscellaneous notes*, 3 volumes, from the Regius Keeper, Royal Botanic Gardens, Edinburgh.

Botanical Magazine for August.—The plants figured are *Rhodostachys pitcairniifolia*, Benth., *Bulbophyllum Ericssoni*, Kränzl., *Boronia fastigiata*, Bartl., *Codonopsis Tangshen*, Oliv., and *Hedysarum multijugum*, Maxim., var. *apiculatum*, Sprague. The *Rhodostachys* is a handsome Bromeliaceous plant from Chili, with the upper leaves, which surround the head of pale blue flowers, bright red on the upper surface of the basal part. The specimen figured flowered in the collection of Major W. L. Harvey at Tredarvah, Penzance. The Kew plants, of which there are several, have not flowered during the last ten or fifteen years. *Bulbophyllum Ericssoni* is a native of the Malay Archipelago and was figured from a plant which flowered in the garden of Sir Trevor Lawrence, Bart., in 1899. Its flowers are large, green, spotted with purple-brown, and have long-acuminate sepals and petals. The *Boronia* is a pretty greenhouse plant from Western Australia, whence it was first introduced into the St. Petersburg Botanic Garden half a century ago. It has been grown at Kew under the erroneous name of *B. polygalifolia*. The figure was prepared from a plant raised from seed communicated by the Director of the Sydney Botanic Garden in 1899. *Codonopsis Tangshen* is an interesting Chinese drug-yielding plant belonging to the Campanulacae. About 1,200,000 lbs. of the drug, known to the natives as "T'ang-shên" and valued on account of its tonic properties, is annually exported from Hankow to other parts of China. The specimen figured and the plant growing in the Rockery at Kew were received from Messrs. James Veitch & Sons. The beautiful *Hedysarum* has been grown at Kew for many years, and a particularly fine bed of it may be seen near the Refreshment Pavilion, flowering in June and July. The variety is described for the first time.

Irish Gardens.—In the account of the various gardens in Ireland described in Article XXXVII. (p. 219 *et seq.*, of this volume) it is inadvertently stated that Darreen (p. 222) and Rossdohan (p. 223) are situated on Galway Bay. They are situated on the Kenmare River.

M. S. del. et lith.

Andropogon citratus D C.